Engineering and Mining Journal

McGraw-Hill Publishing Co., Inc., New York

DEC 8 1917
UNIV. OF MICH. LIBRARY

THERE ARE MANY MAKES AND BRANDS OF HOLLOW AND SOLID

ROCK DRILL STEEL

SCIENCE LIBRARY

But There Is Only One

"BULL DOG"

THE CHAMPION

And it is Manufactured Solely by the

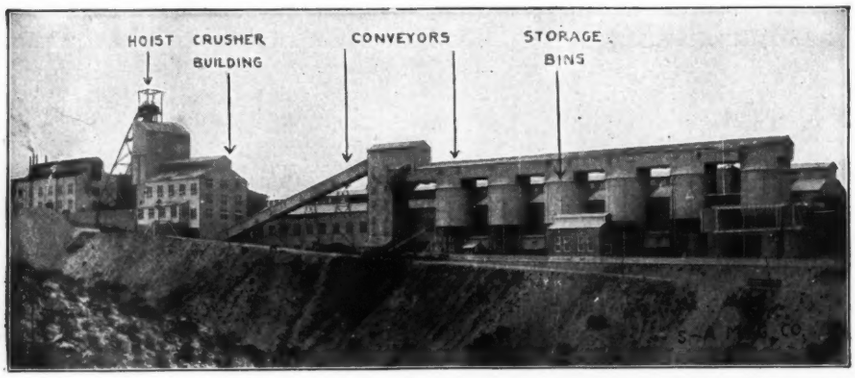
INTERNATIONAL HIGH SPEED STEEL COMPANY

Works: Rockaway, N. J. Main Office: 99 Nassau St., New York City

The S-A Page

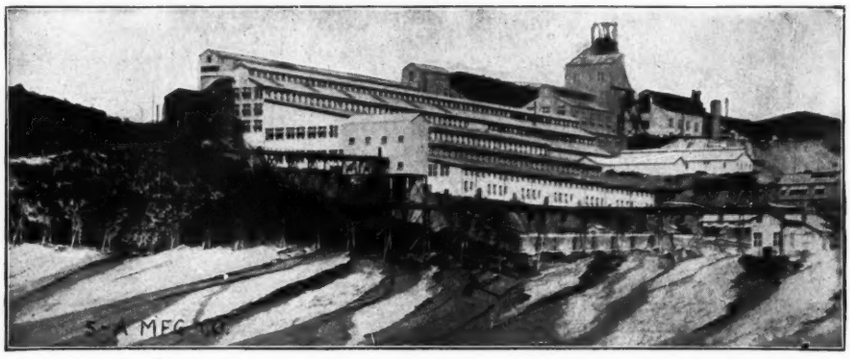
Published Weekly in the Interests of S-A Conveying Engineering

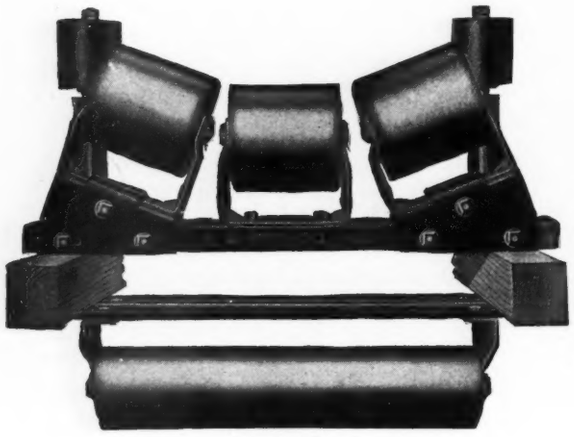
Working Low Grade Ores at a Greater Profit



The illustration shows one of the largest concentrators in the country. More than 3000 tons of ore are treated daily.

Handling costs are maintained at the minimum by the extensive application of "S-A" Equipment which elevates and conveys every ton of ore treated.





Patented

"S-A" UNIT CARRIERS

(PATENTED)

are used on all belt conveyors in the plant.

The Unit Carrier operates on dust-proof ball bearings that cut down the friction to the last possible ounce; and do not require relubrication more than once in six months under the worst conditions.

They are constructed of steel throughout, possessing maximum strength without excessive weight. Extremely flexible, being adapted for all conveying requirements and insuring the least possible belt wear.

The S-A Engineers would be pleased to help you solve any handling or conveying problem for your mill. Consult them now. No charge or obligation.

Ask us to put your name on our mailing list for "The Labor Saver," a free monthly magazine full of live interest to the mine and mill man.

Stephens-Adamson Mfg. Company, Aurora, Illinois

Conveying, Screening, Transmission Machinery

Branch Offices:

50 Church St., NEW YORK
First National Bank Bldg., CHICAGO
79 Milk St., BOSTON, MASS.
H. W. Oliver Building, PITTSBURGH
803 New Bank of Commerce Bldg., ST. LOUIS, MO.
1st Natl. Bank Bldg., HUNTINGTON, W. VA.
824 Dime Bank Bldg., DETROIT, MICH.
310 Stair Bldg., TORONTO, CANADA
412 East Third St., LOS ANGELES
503 Dooly Block, SALT LAKE CITY

Australian Agent—Arthur Leplastrier & Co., Circular Quay East, Sydney
South African Agent—J. Mac G. Love & Co., Limited, 1 and 3 London House, Loveday St., Johannesburg
C. S. Christensen A/S, Post Box 85, Kristiania, Norway

Engineering and Mining Journal

VOLUME 104 DECEMBER 1, 1917 NUMBER 22

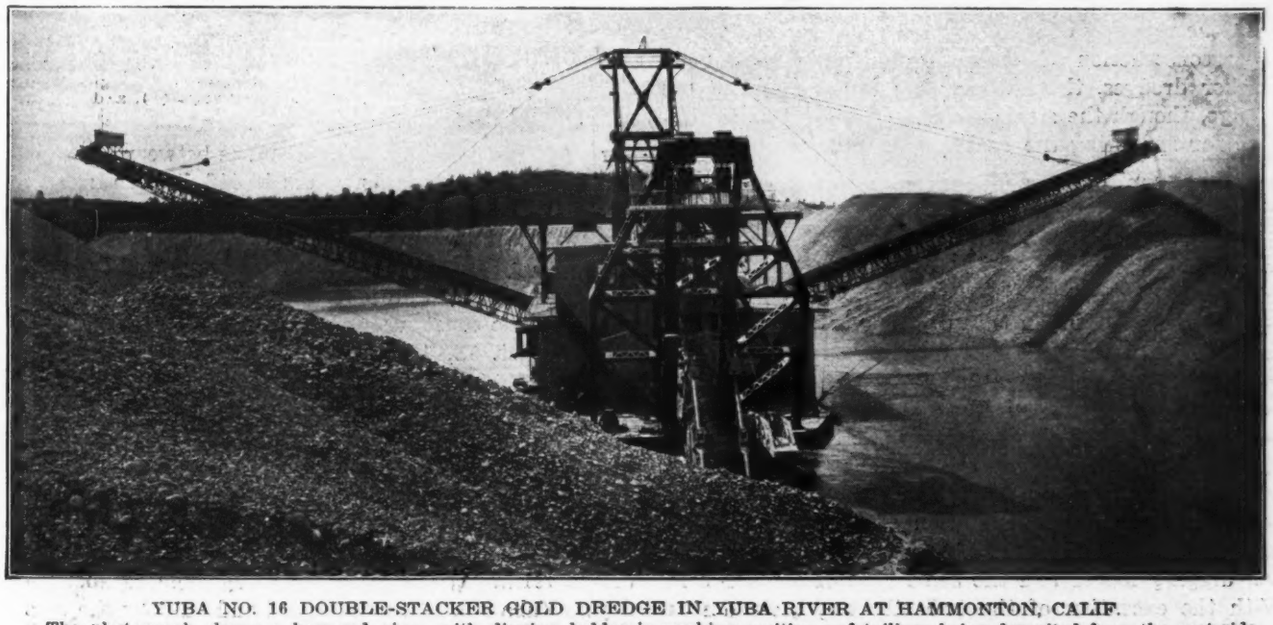
Yuba No. 16 Double-Stacker Dredge

By LEWIS H. EDDY*

This dredge, one of the largest gold-placer dredges in the world and the first double-stacker of its type, was designed for reconstructing the channel of the Yuba River at Hammonton, Calif., coincident with the recovery of gold. It follows dredges Nos. 14 and 15, widening the channel and strengthening the retaining walls by depositing tailings on the inside tailings piles of the preceding dredges.

THE making of a new channel to divert the present course of Yuba River, in Yuba County, California, with the coincident recovery of the gold in the gravels, is being effected by means of the late additions to the dredging fleet of the Yuba Consolidated Gold Fields. Before the installation of the Yuba No. 16 double-stacker dredge,[1] two single-stacker dredges, Yubas Nos. 14[2] and 15[3], were used to recover gold and to prepare the ground for the double-stacker. In the progress of the work the two single-stacker dredges have thrown up two double rows of tailings, leaving a channel between, which is about 500 ft. wide and 80 ft. deep. Yuba No. 16 is digging out this channel, recovering the gold and placing the tailings on the crown of the inside tailings piles which were left by Yuba No. 14 and Yuba No. 15. These double rows of tailings piles form banks or retaining walls about 400 ft. thick at the base and 30 to 40 ft. high. The tailings distributed by Yuba No. 16 add from 10 to 12 ft. to the heighth of the inside rows.

Fig. 1 shows the respective positions, *A* and *B*, of Yuba No. 16, while depositing tailings on the crown of Yuba No. 14 at *C* and Yuba No. 15 at *D*. The channel is being excavated to bedrock, a depth of about 80 ft. The redeposited sand and silt are covered with 10 or 12 ft. of heavy gravel to prevent scouring and to provide a solid stream bed. Only one stacker is used at a time, the starboard or port according to the course the dredge is following and the side of the channel that is being excavated. The direction is approximately south, which is the general course of the river, although the dredge may of course be operated in any direction and place the tailings on either side.



YUBA NO. 16 DOUBLE-STACKER GOLD DREDGE IN YUBA RIVER AT HAMMONTON, CALIF.

The photograph shows a bow-end view, with digging ladder in working position and tailings being deposited from the port-side stacker, crowning the inside row of tailings formerly deposited by one of the single-stack dredges. The view of the retaining wall shown in the background, forming one bank of the new channel, shows clearly the difference between the old tailings pile and the new pile being deposited. Note the dark and the light lines extending from a point where the tailings are dropping, down to the edge of the water

The approximate situation and course of the present (or old) river channel, its relation to the ground being

*Associate editor, "Engineering and Mining Journal," San Francisco, Calif.

[1]"Eng. and Min. Journ.," June 9, 1917, pp. 1032 and 1033.

[2]"Eng. and Min. Journ.," Mar. 28, Apr. 4 and 11, 1914, pp. 645, 703, 769.

[3]"Eng. and Min. Journ.," Aug. 19, 1916, p. 329.

dredged, and the relative positions of the dredges are shown in Fig. 2. In the sketch, *E* marks the old channel; *F*, the ground worked by the single-stackers; *G*, ground (or channel) worked by the double-stacker; *H*, approximate positions of single-stackers; *J*, approximate positions of double-stacker, and *K*, the points at which the present stream will be turned into the new channels. The shaded spaces indicate the tailings piles deposited by the single-stacker dredges. Tailings from Yuba No. 16 are deposited along the crown of the piles made by the single-stackers. The sketch also shows the two new channels, which are necessary in some parts of the field, while in others only a single channel is required. When the work is completed and the stream diverted the old channel will be dredged for gold. It will require about six years to dredge the total area of the ground with Yuba No. 16. One-half of this time will be devoted to working out one side of the new channel between the old tailings piles, and the dredge will then be taken back to the starting point and the other side of the channel will be worked, which operation will consume approximately the same length of time.

Construction Details of Yuba No. 16 Dredge

Yuba No. 16 is the first dredge installed in Yuba Basin field equipped with two stackers and designed to strengthen the banks of the stream. Two of the Natomas type of dredges are equipped with extra stackers, one with two stackers and one with four, and another is in course of construction. But these multiple-stacker dredges are designed for reclaiming the soil coincident with the recovery of gold, and have nothing to do with the reconstruction of river channels. Like the single-stacker dredges, they deposit the tailings behind the dredge, though the stackers are so designed as to provide for spreading the gravel across the width of the

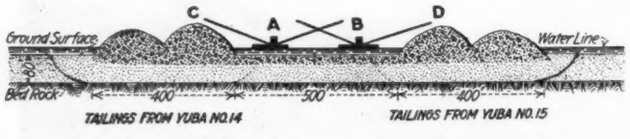


FIG. 1. SECTION OF YUBA RIVER, CALIF.
Showing positions (A, B) of Yuba No. 16 dredge reconstructing channel of Yuba River, Calif. Tailings (C, D) are deposited on the inside of old tailings deposited by Yuba No. 14 and Yuba No. 15 dredges

excavation, and the single-stackers pile the tailings in a single ridge behind. The method of operating Yuba No. 16, with the exception of depositing the tailings, is exactly the same as the operation of the single-stacker dredges, involving the use of the same type of buckets and digging ladder and the same type of stacker belt. With the exception of the two stackers, their design and fabrication, the materials used and the method of construction are identical. Yuba No. 16 is approximately a complement of Yuba No. 15, except as to stackers and some of the dimensions. The all-steel hull is the same as that in Yuba No. 15, being 165 ft. long, 68 ft. wide, and 11½ ft. deep. The digging ladder is 154 ft. long and weighs 145 tons without the bucket line. It is equipped with 100 California-type buckets having a capacity of 18 cu.ft. each and a total weight for the bucket line of 454,000 lb. The dredge is designed to dig a maximum of 82 ft. below the waterline. The main drive, or digging motor, is 500 hp. The total motor equipment is 1085 hp., which is 78 hp. greater than Yuba No. 15. The upper tumbler and shaft have a combined weight of approximately 21 tons, and the lower tumbler and shaft combined weigh approximately 14½ tons. The revolving screen is practically the same as on Yuba No. 15 in size, design and nozzle appliance. The area of the gold-saving surface is 8000 square feet.

Double Stackers 50 Ft. Longer Than Single Type

Each tailings stacker on Yuba No. 16 weighs about 80 tons and is 225 ft. long, which is 50 ft. longer than the tailings stacker of Yuba No. 15. They are situated one at the starboard and the other at the port corner of the stern, the base points being fixed, according to the practice in the construction of dredges that are not

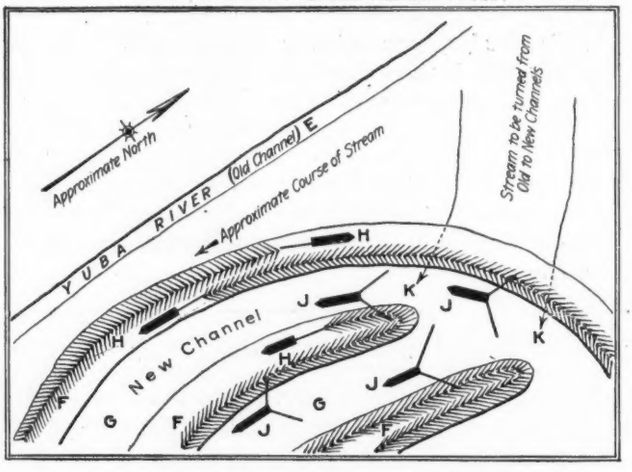


FIG. 2. PLAN OF PORTION OF YUBA RIVER BASIN
Showing old channel of the Yuba River (E); ground worked by single-stackers (F), Yubas Nos. 14 and 15; ground worked by double-stacker (G), Yuba No. 16; positions of single-stacker dredges (H); positions of double-stacker dredge (J), and (K) the course of the stream in its new channel

designed for resoiling. The distance between the outer and upper ends of the stackers is 416 ft. 5 in. and the approximate heighth of the stacker gantry above the waterline is 103 feet.

The hull was built on the same ways and launched into the same pond provided for Yuba No. 15. The first steel for the construction of Yuba No. 16 was laid on Friday, Oct. 13, 1916, and the hull was launched on Nov. 26, 1916. The dredge was completed and began moving by its own power out of the construction pond and through the channel of Yuba River toward the digging ground, one mile distant, on Sunday, Apr. 1, 1917. This is not record time, because there were numerous and extended delays in receiving steel and other essential materials from the East, due to winter blockades of the railways, and these delays aggregated about 30 days. Yuba No. 16 was designed and built by the engineering and shop departments of the Yuba Manufacturing Co., at Marysville, Calif., and assembled by its field-construction department.

Natural Gas Used in 1916 in the United States for commercial purposes amounted to 753,170,253,000 cu.ft., exceeding by nearly 125 billion cubic feet the former record established in 1915. The average price at points of consumption was 15.96c. per 1000 cu.ft. Credit for the increased production belongs to West Virginia, with an output of 299,318,907 cu.ft.; Oklahoma, with 123,517,358; Pennsylvania, 129,925,150; California, 31,643,266; Louisiana, 32,080,975; Kansas, 31,710,438; Texas, 15,809,579; and Arkansas, with 2,387,935 cu.ft. These states produced 132 billion cubic feet more gas than in 1915.

Pyrite in Northern New York

BY D. H. NEWLAND*

Attention is directed to the possibility of increasing pyrite production from the low-grade deposits of St. Lawrence and Jefferson counties, on the west side of the Adirondacks. Extensive belts of pyritized schist and quartzite have locally enriched portions carrying 20% or more of sulphur. Considered capable of supplying 250,000 tons annually of 40-45% concentrates, but the cost would be about 10c. per unit of sulphur. This would show a handsome profit on the present market, though only a small margin on the pre-war price.

THE current discussion as to the need for increasing the supplies of pyrite for acid making has brought out a number of suggestions that merit attention. It appears, however, that most of the plans for relieving the situation look to the development of new fields of occurrence or to the utilization of products that are now wasted in the course of mining and metallurgical operations. The discussion has passed lightly over the possibility of enlarging the output of mines and mining districts now actively engaged in production, wherein may lie a partial solution of the problem at least and an opportunity that seems more attractive than some of the plans put forth, which are essentially experimental in nature.

Low-Grade Deposits in Two Northern Counties

In St. Lawrence and Jefferson counties, New York, on the west side of the Adirondacks, occur extensive belts of pyritized schist and quartzite that locally and in restricted portions carry material that assays 20% or more in sulphur. The belts are in the nature of fahlbands, composed of the normal country rocks impregnated by iron sulphides. Pyrite is the common mineral, but occasionally it may be accompanied by pyrrhotite, or more rarely the pyrrhotite may form independent bodies of itself. The fahlbands in their ordinary phases are too lean to be worth mining; it is only by a relative enrichment, which seems to have taken place through the agency of mineralizing solutions at a period subsequent to the deposition of the disseminated pyrite in the usual phase, that the grade is raised sufficiently to be considered workable. This secondary pyrite appears in stringers, bunches and scattered crystals, and has usually a coarser habit than the pyrite of the earlier formation.

The belts are remarkable for their persistence and regularity of areal development. The larger ones have recently been mapped by A. F. Buddington for the State Geological Survey, which some time ago published an investigation of the origin of the ores by C. H. Smyth.[1] There are at least nine or ten individual belts so far known. The more promising areas from a mining standpoint are grouped along a zone that runs northeast and southwest from near Canton, St. Lawrence County, to Antwerp, in Jefferson County, about 40 miles in length. The schist and quartzite which constitute the strata of the belts have a northeast-southwest strike parallel with the general structural trend and usually dip steeply to the northwest.

Careful study of the field features has demonstrated that the different areas are parts of a single series of beds that have been repeated in outcrop by folding, the strata having been tightly compressed and overturned so as to give a common inclination to the whole. The structure is more complicated, however, than would appear from this simple statement, since the beds, which belong to the oldest of the pre-Cambrian rocks—the Grenville series—have been subjected to repeated invasion by igneous magmas of various later periods. As a result the belts are more or less broken up and interrupted, and the rocks themselves show infusion of igneous materials.

Actual Mining Restricted to Two Belts

The enriched portions partake of the general form of the larger belts; that is, they are tabular bodies or attenuated lenses with a much greater length and breadth than thickness. Some of the bodies have been explored for half a mile or more along the strike, and to a depth of several hundred feet, without reaching the limits. Their width is seldom over 20 to 30 ft., and 50 ft. represents about the outside limit. Altogether they contain an enormous tonnage of lean ore.

Actual mining hitherto has been restricted to parts of two belts—the Stella-Pyrites area on the northeast end of the district and the Richville belt that lies a few miles southwest of the first. The Stella mines, at Stellaville, near DeKalb Junction, have been the most consistent producers and have had an uninterrupted record extending back to 1905, under the ownership of the St. Lawrence Pyrite Co., previous to which time they had been worked intermittently for many years. The mines are based on several parallel lenses or sheets of ore that average a little over 20% sulphur. The ore is brought up to about 45% by concentration with jigs and tables at the mine. The Cole mine south of Richville was operated up to a year or two ago for lump pyrite, which was shipped to a local pulp mill for making sulphite. The sorted ore returned somewhat less than 30% sulphur. At Pyrite, or High Falls, mining was carried on several years ago and the ore shipped in the form of concentrates. The property was taken over about 1907 by the Oliver Iron Co., which still retains control but has not attempted operations. There are known to be large reserves of ore in this property, and the same is true for the Cole mine. Prospecting has been carried on elsewhere in the belts, and some of the showings are promising.

A remarkably persistent outcrop of pyrite schist extends northeast from Antwerp, for several miles paralleling the tracks of the Rome, Watertown & Ogdensburg R.R. In the stretch of five or six miles from just north of Antwerp to near Somerville it is accompanied by hematite bodies which are found adjacent to the pyrite, either in the hanging or footwall of the latter,

*Assistant state geologist, Albany, New York.

[1]Education Department Bulletin 158, pp. 143-183, Albany, 1912.

and which in years past have been exploited on a rather extensive scale so as to afford excellent exposures of the sulphide ores. The deposits show a width of 15 to 30 ft. and their continuity on the strike and dip is well assured. Samples of the outcropping material from a number of places on the Keene, Morgan, Wight and Dickson properties indicate a content of from 22 to 30% sulphur. The ore on the southwest end is coarser in grain and more amenable to concentration. In the vicinity of Oxbow, north of Antwerp, is another belt with bodies of pyrite and pyrrhotite that run above 25% sulphur. A composite sample of ore from one place returned 29.06% sulphur and 0.22% arsenic. The orebodies as exposed measure up to 30 ft. in width.

There are many other localities where ore of the general grade mentioned may be found. It is not to be inferred, of course, that all offer conditions equally favorable for mining; but one may venture the opinion that at least five properties could be selected which combine the essentials of favorable situation for mining, milling and shipping operations.

The greatest drawback to immediate expansion of the output of the district, for which the present ore prices supply an incentive, is the necessity of concentrating all the product. Some ore has been shipped in crude form, as stated, but the outlet for such low-grade material is strictly limited at best. The ratio of concentration to be expected is from two to three into one, and to operate economically a mill unit should be capable of handling at least 500 tons a day. The cost of 45% concentrates may be placed at $4@4.50 a ton, or around 10c. a unit. Under such market conditions as have obtained in years past, when foreign ores were being imported free of duty and bearing nominal freight charges, there is but a minimum of profit in the business. On the other hand, anything like present conditions means a good return above all costs, and if there were any assurances of their permanancy would be sufficient inducement to new enterprise. An output of 250,000 tons of concentrates a year would seem to be within range of the natural resources of the district.

Infection as Accidental Injury

By A. L. H. Street*

The Minnesota supreme court has affirmed an award in favor of an employee at an iron mine, under the Minnesota Workmen's Compensation Act, for injury sustained under the following circumstances:

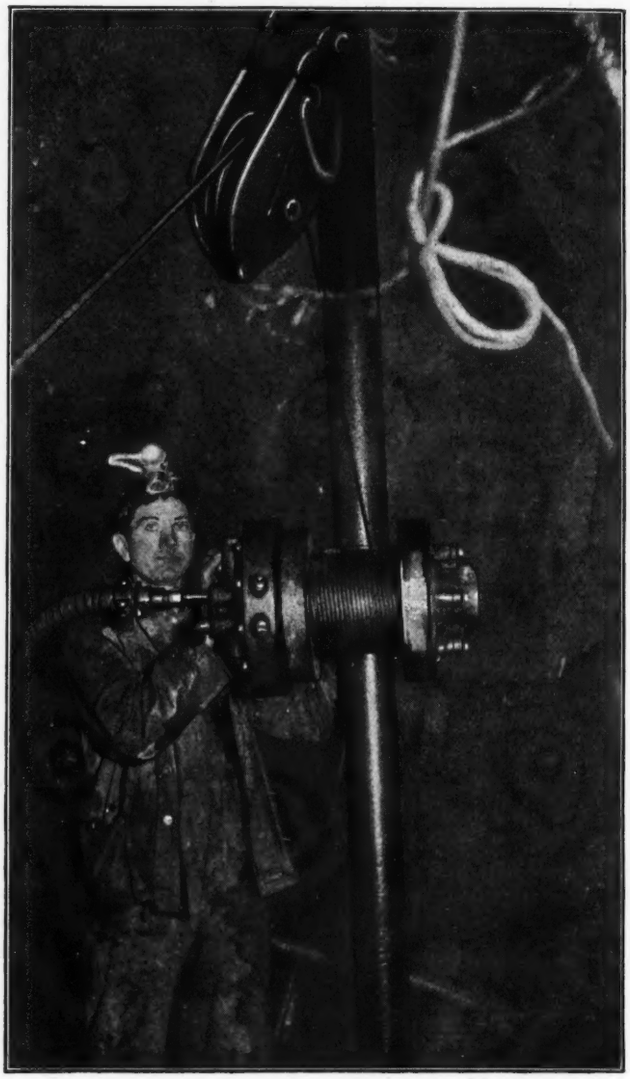
While breaking a piece of ore with a hammer a particle flew into the workman's eye, lacerating the cornea. A fellow employee used a soiled handkerchief in removing the particle, and the eye was washed with water taken from a trough used by miners in washing their hands and faces. Shortly afterward gonorrheal infection set in, resulting in loss of the sight of the eye. Finding sufficient evidence to warrant a conclusion that the infection resulted from the facts above stated, the court holds that the loss of eyesight must be attributed to an accidental injury arising, in the course of the man's employment, within the terms of the Compensation Act. (163 Northwestern Reporter, 755.)

*Attorney at law, 829 Security Building, Minneapolis, Minn.

Application of Portable Column Hoists

By H. L. Hicks*

An item in mine operating costs that has commanded considerable attention recently is the man-power cost of hoisting, handling and hauling light loads. That machines be substituted for men on odd jobs and temporary work as well as on the more important mining operations is highly desirable in view of increasing wage demands. Many needs for portable power have been met by the mine column hoist, which is compact, easily installed and air operated. Mining men in general have become well acquainted with these little ma-



HOISTING IN A RAISE WITH COLUMN HOIST

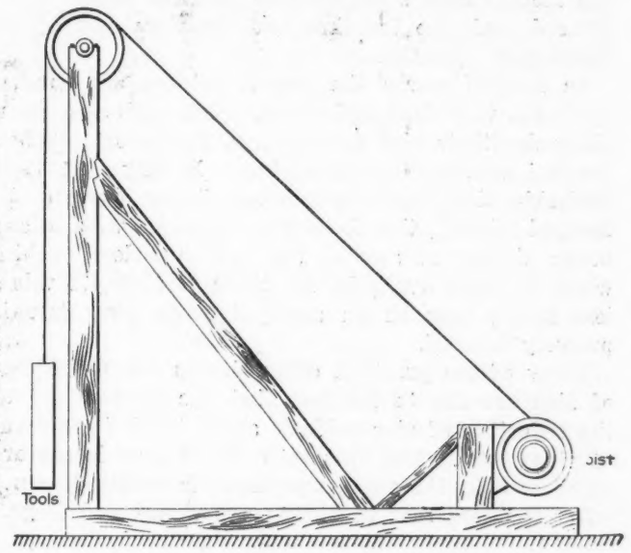
chines in hoisting the light loads incident to the sinking of a winze or driving a raise. Hauling cars in and out of small drifts is also a common application, but there have developed recently a number of unusual and interesting ways of applying portable hoists.

In sinking prospect shafts column hoists have been used to handle nearly everything, as the little two-drill compressor commonly used supplies plenty of power for hoisting when the drills are not working. In the larger sinking operations these hoists have been used to handle

*Ingersoll-Rand Co., 11 Broadway, New York.

sinking pumps, for hoisting the drilling machines before shooting, and to put piping, conduits, etc., in the shaft. In winzes and raises they handle drills, steels, powder, timbers and muck—and men, too, when the bosses aren't around. As auxiliaries to the regular mine hoists needed in the larger winzes, column hoists have proved labor savers in bringing the rope back to the bottom which when done by hand requires several men. One little hoist, bolted to a truck, is transported through a Butte mine for all sorts of odd jobs.

The Alabama red-ore mines employ column hoists in drifts where the grade is too steep to push an empty car by hand or haul it with a mule and the down grade is not sufficient to keep the cars moving by gravity. In some of the Michigan mines where it is necessary to move the tram cars on 30° slopes between levels, hauling up empties and lowering loaded cars, the work is efficiently done by these small machines which handle



DRILLING RIG FOR USE WITH COLUMN HOIST

some remarkable loads. At an Illinois mine they haul loaded cars, weighing 2500 lb. each, up a 30° incline and in New York two 8½-ton cars up a 6% grade.

Pulling timbers from old workings is another field in which one man with a column hoist can do as much as from two to six workmen. Most of the machines use wire hoisting rope, but at Butte there is a strong preference for manila. The uses of column hoists above ground are, if anything, more varied than under ground, ranging from removing dirt from a foundation excavation to driving a tumbling barrel by belt from the rope drum. In the latter case, drill steel is tumbled to clean it for electric welding. At an Alaskan mine a Little Tugger hoist is used at the sawmill for hauling logs from the water up the beach to the lumber pile, and then to pull the logs along in front of the saw. There are reports of similar hoists handling heavy mine timbers at lumber piles in other districts. One of these machines has been utilized at another mine in Alaska to pull 50-lb. steel rails through a rail bender, as already described in the *Journal*.[1] At still another mine, all the fuel oil and supplies are hauled up an incline tram with a column hoist, as labor was too expensive.

[1] "Eng. and Min. Journ.," Jan. 20, 1917, p. 157.

At a mine in Cuba two of the hoists have been placed on locomotives and are used to haul cars in and out of sidings to save switching the locomotive itself. This, however, might not be considered practicable in many cases. To prevent the flow of water into a mine in Arizona dozens of holes were drilled to bedrock and slime was pumped in under pressure. The slime "sets" like cement, and it was believed that a portion of the faults could be filled up and the pumping costs reduced. The drilling rig was similar to a churn drill, the actuating power being a portable column hoist. The string of 3-in. tools was raised by the hoist and allowed to drop of its own weight and by this method 30-ft. holes were satisfactorily sunk.

Losses in Zinc Metallurgy

From the mine right up to the finished spelter there are various sources of loss, but because mining of the ore is usually the business of one party and metallurgy the affair of another party, it is seldom that the total loss per ton of ore is stated. Further than this, various byproducts result from the use of spelter in galvanizing and other works, and these byproducts naturally find their way back to the metallurgical plants to be worked up again into metal.

The fact, also, that zinc often occurs in association with other metal values does not simplify data as to ultimate total recoveries, and therefore losses. In any particular instance there exist some or all of the undetermined losses: (1) Hand-sorting loss; (2) concentration or dressing loss; (3) purchase loss; (4) roasting (calcining) loss; (5) smelting loss.

The first two need no comment; knowing them, it is possible to state what percentage of the metal mined is actually sold, or ready for the metallurgical side. All subsequent losses usually fall to the lot of the reduction or smelting works. For want of a better name, one of these has been called purchase loss; it is not usually discussed in print; many people will deny its existence; but since it does exist, the writer does not see any reason for pretending otherwise, though one may not quote chapter and verse.

The fact is that in Europe, before the war, and perhaps also elsewhere, on exchange of assays the sellers' figures were not always the true assay results, but were "cooked" by being slightly raised; similarly, the figures the purchaser returned might be also "cooked" by being slightly lowered.

The ethics of the procedure do not concern these notes, but as a result the purchaser may on settlement pay for values not present or he may get values without payment—in either case an error is introduced.

Calcining and Smelting Losses

The calcining loss is well understood and can with modern furnaces be kept down to a low figure, but a low calcining loss by itself is no criterion of good work and must be taken in conjunction not only with the sulphur contents, but also with the actual spelter recovery.

The smelting losses are more numerous and complicated and may be roughly divided into the following classes: (a) Fume escaping into atmosphere from

condensers, value absorbed by retorts, etc.; (b) zinc contents of residues discharged from the retorts.

As regards the fume from the condensers, not much of this is finally lost in modern practice. There is sometimes a loss of zinc as chloride due to some zinc chloride, probably mixed with byproducts, having been charged into the retorts.

There is still an absorption of metal values by the retorts and pipes, but this is not so great as in the past on account of the introduction of presses for making the retorts. Other numerous minor sources of loss occur, including breaking of retorts and leakage into the furnace, etc.

The zinc contents of the residues exist in various forms, of which the following are the chief: Zinc as blende, zinc sulphide formed in retort, zinc silicate, zinc oxide metal.

Zinc as blende is due to imperfect calcination or to the fact that the material before calcination was too coarsely crushed.

Zinc sulphide may be formed in the retort on account of the presence of calcite in the ore, which, after the calcination, probably remains as calcium sulphate; this during distillation reacts with zinc oxide, giving zinc sulphate, which by means of the coal present is reduced to zinc sulphide, but not to metal. Or, as is equally probable, the calcium sulphate is reduced by the coal present to calcium sulphide, which with zinc oxide gives zinc sulphide. In either case the final result in the retort is zinc sulphide and not metal. Barium minerals are as objectionable as calcite in this respect. Calcination at too low a temperature will leave zinc sulphate in the charge, and this also will, by reduction by the coal, cause formation of zinc sulphide in the retort. Sulphur in the coal used as a reducing agent has a similar final effect; that is to say, every pound of such sulphur will hold firmly two pounds of zinc.

Calcination at too high a temperature also yields high zinc in retort residues; this is also accentuated by the presence of lead in the ore.

Loss in Zinc Oxide Preparation

Artificially prepared zinc oxides which in their production have been roasted at high temperatures yield on distillation residues high in zinc; in fact, there is a distinct relationship between the temperature of the roasting and the zinc contents of the retort residues. This roasting or calcination at unnecessarily high temperatures causes slight sintering, or in some ores almost initial slagging, and therefore a lack of porosity; hence the reduction in the retort is hindered by lack of exposed surface.

It is known that during calcination at high temperatures zinc oxide reacts with oxides of iron, and probably these compounds are not as easily reducible by the coal in the retorts as the free zinc oxide.

The zinc, which exists as oxide in the retort residues, may have been formed when the retort was opened, previous to discharge. On the other hand, it is most probable that there is always a small current of air getting back through the condenser into the retort and oxidizing some of the zinc vapor, and there are other possible means by which small quantities of air may enter the retort.

Any zinc that exists as metal in the residues must have condensed from vapor on account of "cold spots" in the retort. The temperature of the reduction of zinc oxide, the boiling point of zinc and the latent heat of zinc vapor are well known, but the ease with which zinc vapor condenses is not always realized. It is well seen by putting some zinc into a small transparent silica flask, adopting the necessary precautions to permit air to leave but not to enter the flask, and then applying the necessary heat externally. It will be seen that the boiling zinc will condense on any cool spots and even on those which are obviously only a few degrees lower in temperature than the boiling point of zinc. It is seen from this that by having a cool top to a retort the vaporized metal would condense at the top, fall back again into the hotter zones, be vaporized again, and again condense in the cool top of the retort, and so on. By this procedure the metal contents of the final residues would be increased, and also the time and therefore cost of the distillation operation.

In modern works the retort residues are handled again for their lead and silver, if any, and also sometimes for their zinc contents; so the retort residues are not necessarily a final loss. In any case it is advisable that they shall, when finally dumped, be dumped "clean"; that is to say, not mixed with bricks, boiler clinker or any of the varied useless rubbish which is often available, for these residues, if valueless today, may be an asset at some near date if properly dumped.

Many of the practical difficulties in the metallurgy of zinc are due to the fact that the temperature of the reduction of zinc oxide is above the boiling point of zinc metal. The fact that the various losses are all covered by the various purchase formulas does not affect the case that the losses are varied and large.

Lead Mining in Spain

According to U. S. Consul Louis G. Dreyfus, Jr., of Malaga, Spain, lead was formerly an important product of the province of Malaga, but it has declined steadily during the last 25 years, so that Malaga is now only a shipping port for the output of the mines in the adjacent provinces of Jaen and Granada. On Jan. 1, 1917, there were 72 active lead mines in Jaen, which produced 105,884 metric tons of lead in 1916. At the same date, in Granada, there were eight lead mines, with a production of 1915 tons. Jaen produced more of the metal than any other province in Spain—about 40% of the total for the kingdom.

During 1916 there were 15 plants for the reduction of lead ores in Spain, employing 3580 laborers and turning out 147,407 tons of the metal. In the province of Jaen were three plants, employing 1329 laborers and producing 59,230 tons of pig.

Customs statistics indicate that the exports of argentiferous lead from Spain in 1916 were 21,497 tons, of which 176 were exported from Malaga. In the same year 151,848 tons of low-grade lead in pigs were exported from Spain. Malaga's share of this was 65,458 tons, of which 39,131 went to Great Britain; 18,301 to France; 3193 to Italy; 3162 to Argentina; 751 to Holland; 417 to Portugal, and 503 to Russia.

Status of Flotation-Patent Litigation

BY R. C. CANBY*

Review of flotation-patent litigation with special reference to the decisions in the Miami, Hyde and Butte & Superior cases in the higher courts. "Agitation" used by Hyde; "aëration" now used by Miami. Author points out that Miami infringement was during experimental period and that bubble-column porous-bottom machines, such as the Callow cell, do not embody the "agitation of the patents," owned by Minerals Separation.

IT IS unfortunate for the clearness of the situation that the majority opinion of the United States circuit court of appeals, in Philadelphia, in the case of Minerals Separation vs. Miami Copper Co., was technically for the plaintiff, whereas, in actual point of fact, it was in favor of the Miami company in that it indicates that its present milling operations are not infringing the flotation patents of Minerals Separation. The opinion referred to was based upon a review of the record in the hearing before Judge Bradford in the United States district court in Wilmington, Delaware.

MIAMI EXPERIMENTAL WORK VIOLATED PATENTS

The alleged infringing acts complained of by Minerals Separation, in its bill of complaint, occurred in experimental flotation tests carried on before the time that the Miami company had introduced flotation into its actual commercial operation. The opinion of the court of appeals in Philadelphia was, therefore, confined in its scope to certain experimental investigations and one form of practical operation as set forth in the lower-court record. In the experimental plant there were three auxiliary features; namely, a centrifugal pump, a certain "break in the circuit" (allowing a supposedly agitating fall of the pulp) and a Pachuca tank, used for mixing the oil into the pulp. In the practical operation, the centrifugal pump and break in the circuit were eliminated. A bucket elevator was substituted for the centrifugal pump to raise the pulp to the necessary elevation. Judge Woolley in writing the majority opinion of the court found that these three auxiliary steps in the experimental plant, in combination, performed an agitation of the pulp which was in violence and duration a fair equivalent of the agitation described in the patent.

THREE PATENTS INVOLVED IN MIAMI CASE

There were three patents involved in the Miami suit: U. S. Pat. 835,120, covering the quantity of oil, the degree of agitation, and the character of froth produced; U. S. Pat. 962,678, covering the use of a mineral frothing agent in solution; and U. S. Pat. 1,099,699, a modification of the second patent in suit, covering the use of aromatic hydroxy compounds (phenol and cresol, for example) without acid and without heat. These patents are referred to respectively as "the first," "the second," and "the third patent in suit."

*Consulting metallurgist, Wallingford, Conn.; associated with Miami Copper Co.

Judge Bradford, in his opinion, decided the "first" and "second" patents, with the exception of certain claims, valid and infringed; the "third" patent he found invalid. He considered the invention disclosed in the first patent to reside simply in the reduction in the quantity of oil, as compared with the amount disclosed in the prior art. Of the three patents in the Miami case only the first one, U. S. Pat. 835,120, was involved in the Hyde case. The United States court of appeals in San Francisco, in the Hyde case, had found this patent invalid in that it disclosed simply a difference in degree, in the less quantity of oil, and described no different agitation or character of product than already disclosed in the prior art.

AGITATION USED BY HYDE; AËRATION BY MIAMI

An important difference between the Hyde case and the Miami case should be particularly noted. In the Hyde case the flotation operations under consideration had been carried on in a machine having mechanical agitators or beaters, whereas in the Miami case the concentrating operations were performed in the Callow cell, an apparatus in which the necessary aëration is obtained absolutely independent of any agitation.

The employment of the three auxiliary features of the experimental plant of the Miami, above referred to, in which Judge Woolley found infringement to reside, was merely an unfortunate incident. Between the time of the handing down of Judge Bradford's opinion and the review of the Miami case in the court of appeals in Philadelphia, the United States Supreme Court rendered its decision in the Hyde case.

SUPREME COURT FINDINGS IN THE HYDE CASE

The Supreme Court, in its opinion, found that the record in the Hyde case did disclose not only a "critical" amount of oil, but also "an agitation greater than and different from that which has been resorted to before," and "resulting froth concentrate so different from the products of other processes," and, therefore, upon a combination of these three elements it found patentability.

It was of the greatest help to the court of appeals in Philadelphia to have before it the Supreme Court decision in its consideration of the Miami case. This Supreme Court decision had been considered by Minerals Separation as a tremendous victory. But when applied to the bubble-column mode of flotation, such as takes place in the Callow porous-bottom cell, the decision is most embarrassing to the contention which Minerals Separation tried, unsuccessfully, to sustain.

The opinion of the United States court of appeals in the majority opinion of Judge Woolley, and particularly in its minority opinion, by Judge Buffington, is as stated in the opening paragraph of this article, really in favor of the Miami, since the infringing features specified in Judge Woolley's opinion, although having been in the experimental plant, do not constitute a part of the operating plant of the Miami company, except as stated. When the court of appeals opinion is applied to the actual concentrating plant of the Miami company, none of the infringing features is found.

This article ought to make it clear that the broad claims that Minerals Separation is making to practically the whole flotation field have not yet been sustained by the courts.

Flotation Process Has Advanced Remarkably in Recent Years

The flotation process has developed in so phenomenal a manner since the time I first became familiar with the subject, that the prior art certainly, on the face of it, appears as insignificant. The prior art, however, is by no means unimportant. It is necessary to refer to this question of the prior art not only in its relation to my entrance into the work, but more particularly as to just what were the circumstances which lead up to the Miami Copper Co.'s consideration of flotation.

The impression which Minerals Separation gives in its bill of complaint is that the Miami company took up the subject of flotation subsequent to the installation of Minerals Separation experimental operations at the Inspiration. That this is not the fact was brought out in the testimony at the trial in Wilmington, which shows that I had been engaged in carrying out experiments for the Teziutlan Copper Co. for the purpose of determining which would be the more advantageous, the removal of a Wetherell magnetic plant from the state of Chihuahua to Teziutlan, or the introduction of an Elmore vacuum flotation process plant. At that time the Teziutlan management did not know of Minerals Separation or its process, and it was at my suggestion that a part of the ore sent to London was diverted to Minerals Separation for testing.

A casual allusion made by me to one of the officers of the Miami Copper Co. as to the remarkably interesting flotation results being obtained by an aëration method upon Teziutlan ore, led to an agreement that I go to Miami at the first opportunity. It was some months before this could be arranged. It may be of interest to note that in the meantime, and before the actual signing of the Minerals Separation-Inspiration contract, I had several interviews with the managing director of the Inspiration as to whether it might be possible to combine work for that company with the investigation which I had agreed to make for the Miami. But the Inspiration signed up with Minerals Separation.

Miami Company's Early Experiments

The first flotation experiments at Miami were made with an air-compression method, but this method was in too experimental a stage to warrant the delay necessary for its development, since it was important to determine promptly the advantages of flotation as compared with an economical slime-treatment scheme which had been already developed by the Miami engineers. To save time a Minerals Separation type of machine was built. At that time Minerals Separation patent No. 835,120 was in the courts, and its validity gravely questioned, besides which it seemed a reasonable procedure to ascertain just what advantage flotation would have before entering into any contract; but with the distinct understanding of the officers of the Miami Copper Co. that they had no intention whatever of evading, in their actual operations, any rights which Minerals Separation might establish.

In argument before the United States circuit court of appeals, counsel for Minerals Separation made the statement that the Miami had also copied the Callow cell from Inspiration. This is contrary to fact. The full-length half-width Callow type of cell, referred to in the Wilmington testimony, was built by me, under Mr. Callow's instruction, and installed in the Miami experimental plant some time previous to the introduction of Callow cells at Inspiration.

The foregoing statements are pertinent in that they show that the Miami installation resulted directly not from Minerals Separation, but, primarily, from the Teziutlan experiments based upon entirely distinct methods. The history of the Miami flotation is the more important because of the tendency of Minerals Separation to minimize the prior art in its efforts to make all flotation appear to have resulted from its patent No. 835,120.

Prior Art a Factor in Considering the Patents

This view as to the unimportance of the prior art is exactly contrary, however, to the attitude with respect to the importance of the prior art which licensees of Minerals Separation had assumed in its Australian litigation, in which litigation it was itself a defendant in an infringement suit brought by Elmore. In the Australian litigation it was demonstrated, for example, that the Everson was a most efficient process. Mr. Blount, testifying for the licensees of Minerals Separation, in describing the gangue resulting from his court demonstration of the Criley and Everson process, said: "The gangue remains at the bottom almost clean. In this particular ore the gangue happens to be a very white one, and it is very striking to the eye to see the original black ore converted into an almost perfectly white residuum, and the thick scum of the sulphurets at the top of the water."

What description of the process claimed by Minerals Separation could be more exact? Then there is also a more complete description of agitation froth in the *California Journal of Technology*, November, 1903, than anything given in patent No. 835,120. Practically no prior-art installation is to be observed in the United States. One must go abroad for examples of metallurgical installation, there being a sufficient array in Australia.

But in examining the flotation development in the United States, one is struck by the impress of the independent American metallurgist upon this art. Notwithstanding this, and in spite of the decree of the United States Supreme Court and that of one of our ablest courts of appeal, Minerals Separation is apparently still claiming the flotation field.

It should be particularly noted that the Supreme Court allowed the validity of the first patent in suit, No. 835,120, for a distinct process, having an agitation of definite violence and duration, in the presence of less than 1% of oil, and that the Supreme Court has not, therefore, at all admitted the theory of Judge Bradford, that patentability resided in the mere reduction of oil.

Practical Developments of American Engineers

It would encroach too much on available space in the *Journal* to describe fully how absolutely Minerals Separation adhered to its definite type of machine, even to the minutest detail, and to its manner of operating, until the competition of independent American engi-

neers, in the development of their much more practical methods, was encountered.

Look, for example, at the equipment of the Inspiration mill, which was the first installation of importance undertaken by Minerals Separation in the United States. The original experimental plant contained a small agitation-type machine of about 50-ton capacity. Following this was the 600-ton experimental plant, which had originally an eight-compartment full-size Minerals Separation (Hoover) type agitation froth machine, followed by another of twelve compartments and subsequently a so-called, subaëration-type agitation froth machine.

Contemporarily, at several different plants, as well as at the Inspiration test plant, experiments were being made with the Callow and other aëration machines. In fact, while Minerals Separation was experimenting with its process, flotation was developing more successfully along other lines than those employed by that company, as may be judged from the ultimate flotation equipment of the Inspiration mill, which consisted of "four units with Callow machines; 13 units with Inspiration type machines; and one unit with Minerals Separation machines."

This proportion, only one unit of Minerals Separation machines in a total of 18 units in the finally completed mill, well illustrates how proportionately greater has been the contribution of the independent American engineer in the development of flotation. Therefore one may well dispute the right to proprietorship which the British company claims, since its method was actually superseded by something superior before it could completely demonstrate its economic feasibility. H. Kenyon Burch, quoted above, says that only one unit of Inspiration mill has Minerals Separation machines. Minerals Separation claims that all of the machines are operating under its process, whether they are mechanical-agitation or air-bubble type, which claim is not indicated, however, by the subsequent opinion of the circuit court of appeals in the Miami case.

The Reasons for the Anaconda Contract

In the presentation of its case, in the Miami trial, Minerals Separation laid no little stress upon the "acquiescence" indicated by the fact that the Inspiration, at first under its original contract, and subsequently under the Anaconda contract and supplemental agreement, pays royalty on the tonnage of all of the mill units, regardless of the type of machine.

It might appear, if one went into it, that there was "good business" in this Anaconda contract. One of the Anaconda subsidiaries, the Inspiration, was already under an irrevocable contract to pay the regular Minerals Separation royalty, so, as was brought out in cross examination in the Miami suit, it was not only partially a form of insurance, but may well have been worth $300,000 to release this subsidiary company from its existing Minerals Separation contract, for the benefit of the lower royalty of the sliding scale of the Anaconda "supplementary agreement."

The Anaconda contract and supplementary agreement may be criticised from many angles, but one cannot but notice that its "acquiescence" is dependent solely upon the Supreme Court's "final decision" in the Hyde case, rather than upon any subsequent decision of the Supreme Court affecting the patents at issue. But, if one considers all of the conditions involved, it certainly lessens materially the force of the Anaconda contract as an instance of "acquiescence."

I mention this matter of acquiescence somewhat at length, because such acquiescence has considerable weight not only with the court to whom it is addressed, but more especially with the mining public as a whole. The mining public should pause and find just where it stands. It should consider what danger there is of doing an injustice, on the one hand, or of too readily acquiescing in an injustice to itself, on the other hand.

All metallurgists give due credit to that group of gentlemen, composing Minerals Separation, who were astute enough to perceive the necessity of developing the ore-dressing problem along what are certainly unique lines. They were, however, unfortunate in their choice of the Cattermole process. So occupied, indeed, was their vision with this unpromising process that they entirely lost sight of already existing flotation, so that when one of their investigators accidentally produced proper conditions for flotation of the sulphide, they immediately acclaimed a new and wonderful discovery, disregarding what had been disclosed previously in the field of flotation, and claimed as the cause of the supposedly novel result the one thing upon which they had happened to be at the time experimenting; that is, the reduction in quantity of oil.

Different Factors Emphasized in Prosecuting the Hyde and Miami Cases

How completely, also, in the minds of the inventors the process depends upon the violence and the duration of agitation, as well as upon the proportion of oil, is shown in both opinions of the court of appeals, but is particularly emphasized by Judge Buffington in the minority decision in the United States circuit court of appeals in the Miami case. This dependence upon violence and duration of agitation, and permanence of froth, was particularly dwelt upon by the plaintiff in the Hyde case as distinguishing the patent in suit, No. 835,120, from the prior art. It was agitation, violent agitation, of a violence never before dreamed of. But in the Miami case, before the court in Wilmington, plaintiff's attitude was different. In this case the minute quantity of oil was claimed as effecting the result, and Judge Bradford gave as his decision that the reduction in the amount of oil, as compared with that of the prior art, constituted invention, and upon this basis sustained the patent.

It was the record in the Hyde case, however, which was before the Supreme Court, and upon that record, and its insistence upon violence of agitation and permanence as a characteristic of the froth produced by the process, that the Supreme Court found invention to reside in a combination of these elements with the "critical" quantity of oil.

This interpretation of its patent was vehemently opposed by counsel for Minerals Separation before the court in Philadelphia. The patent was so construed and sustained by the decision of the circuit court of appeals in the Miami case, however. An agitation of the requisite violence and duration was found in three auxiliary devices of the Miami experimental plant; namely, a centrifugal pump, a certain "break in the

circuit," and a Pachuca tank, which was used as a mixer of the oil with the pulp. In the installation in which the bucket elevator had been substituted for the centrifugal pump, and in which there was no break in the circuit, the court found "the agitation of the patent" in the Pachuca tank.

Incomplete Evidence Before the Supreme Court

The Supreme Court of the United States had found a novel degree of agitation, greater than theretofore known, which produced a permanence of froth, of a character not theretofore known, and the use of a critical amount of oil. There was no testimony in the Hyde record to show that greater quantities of oil than the "critical" amount could be used successfully in the actual mill. It would now appear that the Supreme Court was misled by this record, since numerous plants are successfully using oil far in excess of the minute quantity characteristic of the claimed process, and slightly in excess of the limit named by the patent, 1 per cent.

In the most recent litigation, the Butte & Superior case, argued before the United States district court at Butte, Mont., one finds Minerals Separation taking again an entirely new and different attitude. Confronted as it now is by so many actual metallurgical operations in which oil in excess of 1% was being successfully used, it took precisely the position which its opponents had always argued in every prior case, and which Minerals Separation has denied in every prior case; namely, that "oil" used in any excess over that "which is attached to the metalliferous content of the concentrates" is "wasted," "unutilized," "and might just as well flow down the outside of the machine." This is the exact opposite to what Minerals Separation attorneys argued before the Supreme Court, in the Hyde case, and absolutely contrary to the contention upon which the Supreme Court sustained the patent, and found the efficacy of the "critical quantity" of oil.

Flotation Takes Place in Modified Water

In litigation certain assumptions of theories as to the underlying causes of flotation have been advanced by one side or the other, as, for example, in the Miami case, the moving-picture film of bubble-holder experiments in the Wilmington court, by the plaintiff, with the object of showing a different degree of attachment of air bubbles for sulphide with large amounts and minimum amounts of oil. The Miami company contended that flotation takes place in "modified water"; that is, water having a contaminant which reduces its surface tension, with the idea of illustrating that all of the various prior-art processes, as well as that of the patent in suit, No. 835,120, were fundamentally identical, all being dependent upon the same underlying principle; that it is the modifying of the surface tension that is necessary, and that, having added sufficient contaminant to modify the surface tension, any excess, more or less, of the contaminant or modifying agent, is immaterial, apart from the question of economy.

I have been greatly impressed by the fact that since the Miami case was argued in Wilmington a number of papers have been written by professors and instructors in our technical schools discussing the underlying principles of flotation. These papers were prepared in the laboratories of the technical schools, the authors being unbiased by any particular interest and untrammeled by the necessity of sustaining a particular theory, and yet none of these writers has found the "critical quantity" of oil. At the hearing of the Butte & Superior case before the district court in Butte, several testified as to their methods of investigation, and reproduced their demonstrations before the court.

The Famous Claim 12 Rejected by Patent Office

Now, Minerals Separation, which inadvertently stumbled upon a flotation result in its investigation of a process in which the preferential affinity of an actual oil for sulphide surfaces is the essential feature, took this impractical process and applied the supposed discovery to it and patented it as an improvement upon or a development from the Cattermole process, whereas the process is of the previously existing art. These gentlemen consequently state that their flotation process is also, in some way, the result of the preferential affinity of oil for sulphide. It is true that Everson, among others in the prior-art patents, had the same crude idea as to preferential affinity. It must be remembered that flotation was not new at the time of the alleged discovery. It was known, and had been known for many years. Therefore it was necessary, in order to control the process, that the company should devise some new feature to distinguish what it claimed as its new method of flotation from flotation as already known. In applying for its United States patent, Minerals Separation included this claim:

> 12. The process of concentrating powdered ore which consists in separating the minerals from gangue by coating the minerals with oil in water containing a fraction of 1% of oil in the ore, and recovering the oil-coated mineral.

The file wrapper in the United States Patent Office shows that this claim was rejected upon the ground that it expressed "merely a difference of degree" over prior patents, Nos. 763,260 and 793,808. Following this action by the Patent Office, Sulman, Picard, and Ballot cancelled the claim so rejected. Claim 12 was the only claim then in the application that did not specifically and explicitly call for the formation of a froth, and following the cancellation of this claim, the patent was granted, every claim in the issued patent specifying in explicit terms agitation and the formation of a froth, as the process covered by the patent. It should be most carefully noted that this is true also of patents Nos. 962,678 and 1,099,699, the second and third patents in the Miami suit, each claim of which calls for agitation to produce a froth.

Having been denied patentability of a claim "expressing merely a difference of degree," it was incumbent upon the plaintiff, in the Hyde case, to particularly and most forcefully dwell not only upon the degree and violence of agitation, but upon the peculiar characteristic of the froth produced by its process. The United States circuit court of appeals in San Francisco did not find that patent No. 835,120 disclosed a greater degree of agitation or a different character of froth from that shown in the prior-art patents. The United States Supreme Court, however, reversed the San Francisco court, not on a question of law, but of fact. It found that the record did disclose greater agitation and a characteristically permanent froth.

In the Miami case, however, a new set of conditions exists. There is neither violent agitation to produce a

froth, nor the permanence of froth, which had been declared to be characteristic of the patent, No. 835,120, as it was presented to the United States Supreme Court and as now definitely defined by that court.

It would occupy too much space to follow the complete change of attitude of Minerals Separation during the progress of the hearing before the Wilmington court. As the case proceeded, Minerals Separation changed its position until the violence of agitation of the process, as set forth in the Hyde case, was so modified as to meet the results arising from the gentle ebullition of bubbles through a porous medium, a condition no more violent than that which is produced in a glass of carbonated water.

Statements as to Froths

Then before the United States circuit court of appeals in Philadelphia the following most remarkable statement of the contention of Minerals Separation was made by counsel for plaintiff in closing his opening argument:

> Whenever our modifying agent is used, a person infringes who gets air into the pulp in any fashion and agitates the mixture by any means to a sufficient extent to cause the mineral particles to attach themselves to air bubbles and rise therewith above the top of the mixture in a collection of bubbles and metal particles, to wit—froth.

As Judge Gray so aptly remarked in his argument, he did not know how much of the "midnight oil" had been consumed in writing so carefully prepared a proposition, but it was certainly not a "minute quantity."

Compare with the above the following description of the froth of the process as given by Mr. Sulman, one of the patentees of No. 835,120, when asked to state his distinction between the froth or scum which was referred to in the patent in suit No. 835,120, and that of patent No. 793,808, which in Judge Bradford's opinion is stated as being the process used by the Miami Copper Co.:

> A—I have already described the froth produced in the patent in suit as being of a very dense, coherent and thick deposit. The floating concentrate obtained in patent 793,808, on the other hand, was very feeble and tender in character, the very reverse of coherent and persistent and was of such a nature that extreme care had to be used in its collection.

Could two attitudes be more at variance than this contention of counsel as to what is the process of patent No. 835,120, and that of one of the joint patentees, who should surely have known what the process really is? However, it was upon such testimony as that of Mr. Sulman, given above, that the United States Supreme Court was led to find novelty in the character of the froth.

These patentees then come before the Philadelphia court, and repudiate this character of froth. They, in this case, practically ask for the reinstatement of original claim 12, which was properly denied and which they themselves, thereafter, abandoned to the use of the mining public of the United States, and, as Judge Gray again so aptly says, making thereby a contract with the people of the United States, which contract they now attempt to break.

Attitude of Courts on the Agitation Froth Process

The quotations from the testimony of experts or the arguments of counsel, while enlightening, are not so important, now that we have the opinions of the United States Supreme Court and the United States circuit court of appeals as a guide. The decision of the Supreme Court, which is based upon the record in the Hyde case, absolutely limits the Minerals Separation flotation process to what is generally known as the agitation froth process, having "an agitation greater than and different from that which had been resorted to before," and a "resulting froth concentrate so different from the product of other processes." The decisions of the United States circuit court of appeals in Philadelphia, both majority and minority opinions, would unquestionably place any partly mechanical violent-agitation froth process, with less than 1% of oil, within the scope of the patents.

It is possible that patent No. 835,120 may come before the Supreme Court again in a subsequent case, with a record having new matter of importance, such, for example, as the *California Journal of Technology*, with its description of the agitation froth process much more clearly stated than is done in the patent itself. But for the immediate present, and for some time to come, if not for the life of the patents, no one can use the violent-agitation froth process with the "critical amount" of agent without danger of coming within the scope of the patent, unless possibly by the use of some agent not in the present groups enumerated by the Minerals Separation patent. There are such already known, however, strange as it may seem that anything could possibly have been left out of the lists of oils and frothing agents so carefully compiled by Minerals Separation.

When, however, one comes to the bubble-column form of flotation apparatus, with which, as previously stated, 17 out of 18 units of the Inspiration mill, as well as a large number of other American flotation plants, are operated, a different proposition is presented.

Bubble-Column Machines Are Claimed To Be Without the Scope of the M. S. Patents

These bubble-column machines, the Callow-type machine, the Inspiration-type machine, etc., are not agitation froth machines, and therefore do not come within the scope of any of the patents, Nos. 835,120, 962,678 and 1,099,699, as these patents were defined by the United States circuit court of appeals in Philadelphia in the Miami decision or as No. 835,120 was defined by the United States Supreme Court in the Hyde case. When these decisions in their relation to the bubble-column operations, such as the Callow cell, for example, are considered, the question becomes solely whether the result produced in the porous-bottom cell is the effect of agitation. I consider that it has been established that this is not the case, and that such a porous-bottom, bubble-column cell itself, therefore, operates entirely outside of the scope of these patents.

It is unfortunate for the clearness of its majority opinion that the court's attention was so firmly fixed upon the percentage of oil used in the final demonstration by the Miami company; this demonstration was in fact made to controvert the claim of opposing counsel that the "spiral-coil" apparatus could not operate with so high a percentage of oil. With that idea principally in mind, the court did not sufficiently observe the preparatory details, in which the mixing of the oil, so as to absolutely preclude any suggestion of agitation,

was a clearly demonstrated feature. But after all, that is immaterial, since the court in its decision says:

> If the only agitation to which the pulp is subjected (after such agitation as in the prior art was necessary to mix the oil and the ore) was the agitation of the Callow cell, we would not say that that agitation amounted to or was the equivalent of the violent agitation of the patent disclosure and constituted infringement; but in the process we are considering and upon which the decree which we are reviewing was based, the Callow cells were not the whole process, but were merely the last of four distinct parts of the process, the other three being the process of the patent or its fair equivalent.

Callow Aëration Not of "Characteristic Violence"

Could any sentence be framed to more completely state that the Callow cell, even when preceded by a considerable degree of agitation, "that of the prior art for mixing pulp and oil," is not an operation of the patent?

But furthermore the decision says:

> It is equally true that in this fourth step aëration is direct, and is not the result of or caused by agitation. On the contrary, agitation results from aëration, and such agitation, though present in some measure, is not even approximately of the violence and duration of the agitation of the patent. The operation of the Callow cell certainly possesses these distinguishing features from the operation of the process where aëration is caused by agitation.

This again is a most clear statement and the court, somewhat preceding these paragraphs, handed down a general and broad enunciation as follows:

> It is clear that if the defendant practiced the process of the patent and obtained a different result, or if it practiced a different process and obtained the same result, it did not infringe.

The application of this broad enunciation would mean that if up to the point where the pulp enters the Callow cell it had been subjected to "such agitation as in the prior art was necessary to mix oil and ore" there would be no such an infringement as Judge Woolley, in his opinion, found in the Miami experimental plant. Such prior-art agitation would not be that of the patent, which agitation the Supreme Court found to be an "agitation greater than, and different from, that which had been resorted to before," and therefore not that of the prior art. But, more than this, the broad enunciation sets forth that even were this agitation actually that of the patent, if it did not produce the result of the patent it would not be infringement. A mere opinion as to the comparative violence of different agitations is necessarily vague. But the decision names something absolutely definite and susceptible of positive demonstration. If the pulp which enters the Callow cell, when brought under the proper conditions, does not perform the "result," that is, the separation of the process of the patent, there is no infringement.

Subsequent Assays Showed No Beneficial Results from Use of the Pachuca Tank

Unfortunately there were no assays accompanying the demonstration made in the presence of the plaintiff's experts at the Miami experimental plant. These experts took a full set of samples, of which duplicates were held by the Miami company but not assayed. Nor were the assays of plaintiff's samples brought forward. A few days subsequently, however, the same experiment of cutting out the Pachuca tank was repeated, and may suggest why Minerals Separation did not bring forward its assays of the samples; the assays of this experiment are contained in defendant's exhibit No. 46 in the Miami case and are as follows:

> Grab samples of concentrates and tailings were taken under normal conditions (that is, with the Pachuca in operation). The samples assayed as follows:
>
> Tailings = 0.54% Total Cu.
> Tailings = 0.43% Oxide Cu.
> Tailings = 0.11% Sulphide Cu.
> Concentrate = 42.52% Cu.
>
> Grab samples taken after the Pachuca had been stopped for 45 minutes. The samples assayed:
>
> Tailings = 0.57% Total Cu.
> Tailings = 0.43% Oxide Cu.
> Tailings = 0.14% Sulphide Cu.
> Concentrate = 46.60% Cu.

These assays show clearly that the stopping of the Pachuca made no difference in results.

Pachuca Tank Ultimately Abandoned at Miami

The court refers to the experiment made in the operating unit of the Miami mill in which, during an eight-hour shift, results were actually better in that half of the unit in which the Pachuca was not operating. The court was impressed, however, by the fact that the use of the Pachuca was resumed at the close of the test. What the court designates as the "fourth process" is most interesting, and it is unfortunate that that was not properly in record as evidence.

The demonstration referred to in the Philadelphia decision as the "third process" was made at my instance, as I telegraphed the management at Miami to have this test made, after hearing the testimony of plaintiff's witnesses who had visited the Miami experimental plant as to the apparently important presence of "agitation froth" in the Pachuca, the quantity of which they apparently honestly overestimated. The subsequent abandonment of the Pachuca mixers naturally followed such a demonstration as that described as the "third process," but unfortunately the fact that the Pachucas had been abandoned was not in the record, and was therefore not a matter proper for consideration. It is, however, a most convincing demonstration of the absolute absurdity of Minerals Separation contention as to the function of a Pachuca mixer.

"Agitation of the Patents" Not Embodied in Callow Cell

As to this agitation, no sentences could be more clearly worded to state emphatically that the operation of the Callow cell is not the agitation of the patents in suit than those in the majority opinion of the court, as written by Judge Woolley and already quoted. In writing the minority opinion of the court, Judge Buffington says, in conclusion:

> I would hold that the step of the process, "agitating the mixture until the oil-coated mineral matter forms into a froth," meant the novel air-entraining agitation which the patentees disclose, and did not cover the novel air-releasing agitation which the defendants disclose.

Moreover, Judge Woolley says, in the majority opinion of the court:

> But in the process we are considering, and upon which the decree we are reviewing was based, the Callow cells were not the whole process, but were merely the last of four distinct parts of the process, the other three being the process of the patent or its fair equivalent.

This is an absolutely clear statement that it was "the other three" parts of the process, the centrifugal pump, the "break in the circuit" and the Pachuca tank, and not the Callow cells, the fourth step, which were "the process of the patent or its fair equivalent."

Looking back to the time of the supposed "discovery" of the process set forth in patent No. 835,120, it will be noted that the disclosures in the flotation art were already too numerous to admit of anything really basic being claimed.

The Discovery of the "Minute Quantity of Oil"

The minute quantity of oil, less than 1%, as compared with Everson, seemed phenomenal, but not so when compared with the "Froment instructions," which these inventors already had in their possession. The "Froment instructions" were the instructions which Froment sent to Mr. Ballot and his associates at the time they purchased the Froment patent. The information given was not public information, in the sense that it had been published, but it was information given to the patentees of patent No. 835,120.

The Cattermole patent literally, if not actually, disclosed a less amount of oil than detailed in No. 835,120 if one considered its use upon such low-grade ores as those now usually treated by flotation, because the amount of oil is figured against metallic content rather than total weight of ore treated. The statement, therefore, that the new process was brought about by reduction of oil to less than that technically disclosed in the Cattermole patent was not a fact.

Practically, however, the possibilities of minute quantities of oil were brought to the attention of the world through the expansion of flotation to other fields than the treatment of the rich Australian middlings upon which Minerals Separation had been attempting to use the Cattermole process, and the realization of this possibility has had the greatest influence upon the progress of the art. The minute amount of oil described by Minerals Separation as "critical," however, was mistakenly assumed to be the cause of the flotation phenomenon. As shown, it was the one element in the Cattermole process the discoverers happened to be investigating when they accidentally produced flotation results. Then a wide guess was made as to the limit and the amount of oil in this supposedly new discovery. Under 1% was staked out as their claim. No one must use from 1% *down*, though Froment had already told them of 1% *up!* Considered in this light, at least so far as a mere difference in amount of oil is concerned, the discovery does not appear to be so startling.

Supreme Court Accepted "Critical Amount of Oil," Characteristic Agitation and Froth

The United States Supreme Court was prevailed upon to accept the idea of a "critical" amount of oil. It also found that in order to cause this critical amount of oil to function, it was necessary to employ a definite degree of agitation, greater than that of the prior art. Also that the resulting froth, to be characteristic of the process, must have a greater degree of permanence than had been previously produced. It has been demonstrated, however, that the permanence of the froth is due to the solid particles held within the viscous film of the bubbles.

It was found, through microscopic examinations by Professors Taggert and Beach, that these solid particles, in a flotation froth, lie completely within this viscous film. The particles must consequently be exceedingly small. Might one not, therefore, much more consistently claim proprietorship to flotation of a "minute particle," in modified water, than to admit the patentability simply of a minute quantity of the modifying agent? Furthermore, flotation practice actually shows that the minuteness of the sulphide particles is an essential in order that the particles may be held within the viscous film and floated, but the quantity of modifying agent has most certainly been shown, by practice, not to be "critical."

The gentlemen composing the Minerals Separation group, in their consideration, originally, of an accumulation of zinc-lead middlings, in Australia, were most astute in their recognition of the possibilities of certain processes, the practical development of which metallurgists, owing to their conservatism, had neglected. The mining world should not fail to give due credit to these gentlemen for their marvelous perception as to the possibility of such processes, even though the evidence of such perception has been most largely shown in the development of a monopoly in patent ownership and by the expenditure of large sums in patent litigations, rather than in metallurgical developments.

Miami Flotation Followed Teziutlan Experiments

As to the Miami flotation installation, it came about, as already related, indirectly through the Teziutlan experiments and without any intention of usurping or evading any just rights of Minerals Separation, having simply the purpose of developing something which appeared to be much more promising. A natural prejudice against anything so revolutionary as flotation had, in this case, to be overcome and questions as to its practicability satisfied. Fortunately the atmosphere of doubt and mystery as to the practicability of the process itself has now been entirely swept away by a perfect avalanche of technical literature and a most remarkable advance in successful flotation practice.

I feel that the legal situation also has been cleared by the decisions of the United States Supreme Court and the United States court of appeals in Philadelphia, so that there should now be nothing to retard further the development of flotation along the lines so successfully pursued by our American engineers in bubble-column flotation.

However, notwithstanding these activities of Minerals Separation, against which this article is an earnest protest in behalf of the mining public, it is apparently a fact that of upward of 400 mining operators who are now using flotation, fewer than 10% of that number, as shown by the record in the recent hearing in Butte, have acquiesced in the patent contentions of Minerals Separation. And, more than that, of those who have acquiesced, there is in the Inspiration mill, for example, only one unit out of a total of 18 units, employing a method of flotation which comes within the scope of the patents as construed by the United States court of appeals at Philadelphia, in the Miami case.

Supplementary Comment Suggested by the Butte & Superior Decision

Since writing the foregoing, Judge Bourquin has handed down (Aug. 25, 1917) the opinion of the United States district court at Butte, Mont., in the Butte & Superior case. Because of the fact that the method of operating, which has been considered by Judge Bourquin and upon which his decision is based, is so entirely different from the method of porous-bottom cell, Judge

Bourquin's decision has absolutely no bearing whatever upon the porous-bottom cell method of operation. However, it seems advisable to add this appendix in order to point out again the difference in operating conditions obtaining in the two methods, that is, that of the violent-agitation froth method, and that of the bubble-column method of the porous-bottom cell; such as the Callow cell. As has already been pointed out in the article, the United States Supreme Court in its decision most clearly and distinctly limits the process of patent No. 835,120 to a definite degree and duration of agitation. The Butte & Superior company was, as Judge Bourquin states, admittedly employing the agitation as well as the other elements of the process of the patent.

After Jan. 7, 1917, because of the Supreme Court decision, the Butte & Superior increased the oil to an amount greater than that of the patent, admittedly for the purpose of coming within the prior art. Now, the gist of Judge Bourquin's opinion is that this increase of oil, having been made by the employment of a useless and even harmful oil, "having no more effect than the addition of so much milk or other useless substance," does not avoid infringement. He also says, however, on the other hand, that if the oil were effective and useful, instead of inert and harmful, this excess would be of that abandoned by the patentees to the public and would involve no infringement. In the Butte & Superior case, the question is one entirely of oil used. According to Judge Bourquin, it involves not only the amount of oil, but also the efficacy of the oil employed. Whether the question as to the efficacy of the oil is actually of the patent, or has simply been injected into it by Judge Bourquin, need not at present be discussed, but I do not find it in the patent or in the Supreme Court interpretation of the patent.

Use of Bubble-Column Method at Inspiration

The bubble-column method of the porous-bottom cell, however, such as the Callow cell, in its legal aspect follows absolutely different lines from the method employed by the Butte & Superior company. The bubble-column method is that referred to in the Miami decision in the circuit court of appeals. The porous-bottom cell method, moreover, is not from any point of view a mere evasion of patent No. 835,120 and its corresponding patents, but is a radical and distinct improvement over the method of the patents at issue. That it actually is a decided improvement is clearly indicated by the fact that in the Inspiration mill, as already stated, 17 out of the 18 units used this porous-bottom cell method. It is used solely because a carefully made series of tests, side by side with the agitation froth method, demonstrated unquestionably that the porous-bottom cell method is the better. That it was not used merely to evade the Minerals Separation royalties is clearly manifest by the fact that, owing to an irrevocable contract, which was made prior to the time of these comparative tests, the Inspiration had bound itself to pay the royalty upon all tonnage treated. There was, therefore, no possible exception to be made as to the tonnage treated in the porous-bottom cells in these 17 units, but royalty had to be paid just the same as upon the one unit using Minerals Separation's own agitation froth method.

The United States court of appeals in Philadelphia, in the Miami case, has, in both its majority and minority opinions, clearly indicated that the porous-bottom cell method would not in any way constitute infringement; that its degree and duration of agitation does not approach that of the patent; and that the separation is not the result of such agitation as is incident to the operation of the cell.

Some Marked Difference Between the Miami and Butte & Superior Cases

It will thus be seen that the Butte & Superior case, in its question of infringement, relates entirely to the oil used, as to quantity and, according to Judge Bourquin's opinion, also as to efficiency of the oil. In the Miami case, however—and this would apply to all porous-bottom cell operations—it is entirely a question as to the degree and duration of agitation, and as to the character of the froth produced, and is in no wise a question of the oil or modifying agent, either as to its quantity or its character.

It might be well to note just here that in the second patent in suit in the Miami case the patent makes no reference whatever to the fraction of 1% of reagent, nor does it in any way limit the quantity of soluble frothing agent to be used. It should be particularly noted, also, that this second patent, as well as the third patent, is precisely the same in its claims as the first patent, both as to its degree and time of agitation as the manner of producing its froth. Judge Bourquin's decision makes no reference to the second and third patents in the Miami suit, since these two patents were not considered by him.

It may appear superfluous to discuss more fully a decision which has absolutely no bearing whatever upon what I consider the more efficient porous-bottom cell method of flotation, except that it may be appropriate to mention certain of its features in their bearing upon things which have been said in the first part of this article. Judge Bourquin's decision reflects distinctly the manner in which counsel for Minerals Separation have completely changed their entire argument. I have already shown how absolutely different, in the Butte & Superior case, was their argument from any arguments theretofore made by them, they even claiming what had heretofore been the contention of their opponents, that any oil in excess of that actually necessary to do the work was merely waste; "and might just as well have run down the outside of the machine." When reading Judge Bourquin's opinion, with his explanation as to the minute quantity of oil and the necessity of varying all of the different conditions of the operation to meet the varying circumstances, it is difficult for one to realize that he is not reading the defendant's argument. In illustration of this, take, for example, the following sentence:

> The tendency *was* [italics are mine—R. C. C.] to attach prime importance to the reduction in amount of oil used, when in fact this is but a necessary incident (for which there are substitutes if not equivalents) to the creation of the infinitude of bubbles that do the work.

In all of its hearings the different defendants have argued just that very thing—that the reduction of oil was an "incident." There is another paragraph which is of particular interest. It is as follows:

> How the air particles are introduced into the pulp is immaterial. For, introduced, they are still particles and

not bubbles. Agitation subsequent to introduction is vital and alone can convert air particles into water-oil-air bubbles. It is this subsequent agitation that, within the claims of the patent, agitates "the mixture until the oil-coated mineral matter forms into a froth" or "to form a froth." And it is all one whether this be applied agitation or self-agitation, the agitation set up by the air particles themselves in merely rising through the mass and thereby coming in contact with both water and oil all co-acting to form bubbles which capture the metal.

Judge Bourquin may have been completely confused by the plaintiff's new line of argument so to have read into the patent any such description of the process as given in the above paragraph. What he says as to "self-agitation," agitation by the air particles "in merely rising through the mass," is in absolute conflict with the distinction made by the court of appeals in Philadelphia, and is actually nothing less than the reinstatement of the original claim 12, which was properly denied patentability by the United States Patent Office, and subsequently abandoned by the patentees themselves. The porous-bottom cell method of operation was not before Judge Bourquin, so he may not, therefore, have so fully realized the distinction between the two methods of aëration as would otherwise have been the case. He certainly could not have been conscious of how much the specious arguments of the plantiff's counsel induced him actually to read into the patent, nor to what extent he was thereby placing his opinion in absolute conflict with the court of appeals in the Miami case.

There are unfortunately also many among the mining public who do not fully understand the legal distinction which exists between the violent-agitation froth method and the porous-bottom cell method of flotation, and who may not realize that Judge Bourquin's decision has no reference whatever to the latter, and thereby may be led to further misunderstanding of the real situation through the unwarrantedly wide scope claimed for Judge Bourquin's opinion by certain correspondents in financial and other journals.

Research in the United Kingdom

OTTAWA CORRESPONDENCE

In the 1916-1917 report, which is the second that has been issued by the Committee of the Privy Council for Scientific and Industrial Research, of London, England, there is mention of a number of matters which are of interest to metal mining engineers. Under the chairmanship of Sir Robert Hadfield, preparations are being made for taking a survey of what can be done in the way of conducting a research on tungsten and its commercial applications. This work may lead to a much extended use of this metal and so in turn to a greater search and demand for deposits. Investigation has also begun of the existing knowledge and practice of the zinc industry, and the smelting and refining of copper, the quality of copper and the copper alloys. The Institution of Mechanical Engineers has received a grant for research into the properties of the lighter alloys, among them being aluminum-iron, aluminum-silicon, aluminum-magnesium, and orther combinations.

Eight researches on the better recovery of tin and tungsten are now being conducted, and the results, though not published, are said to show a 5% improvement in the recovery at the Cornish tin mines.

Ore Smelting in the Swansea District of Wales

An important industry of Swansea is the smelting of ores, especially copper and zinc. The industrial district from Port Talbot on the east to Llanelly on the west has been described as one of the largest metallurgical centers in the world. In normal times nearly every kind of ore is smelted in this area. Copper smelting was the first great manufacturing industry of Swansea, opening up the coal industry of the district for the smelting of ore and establishing a large shipping trade, wooden vessels being built first for bringing ore from Cornwall and later from Chile.

The amount of copper ore imported since the outbreak of the war has declined by almost 40%, says a recent U. S. Consular Report, while imports of copper regulus and precipitates have remained practically normal and arrivals of zinc ore have increased. Separate figures for the imports of these ores during 1916 are not available. According to the annual returns of the Swansea Harbor Trust, the imports into Swansea of copper, zinc, lead, tin, nickel, and lead ores, together with their alloys, amounted to 93,310 long tons in 1916, as compared with 95,878 tons in 1915, 155,055 tons in 1914, and 113,293 tons in 1913. Of the total for 1916 the greater part consisted of copper and zinc. Copper ore was supplied principally by Mexico, South Africa, and the United States; zinc ore came chiefly from Italy and Algeria.

SWANSEA'S SPELTER TRADE

The spelter industry of the United Kingdom is largely centered in Swansea. During the pre-war year 1913 the production of spelter in the United Kingdom was about 60,000 metric tons and the home consumption 195,000 tons. The British producers were thus able to supply only one-third of domestic requirements.

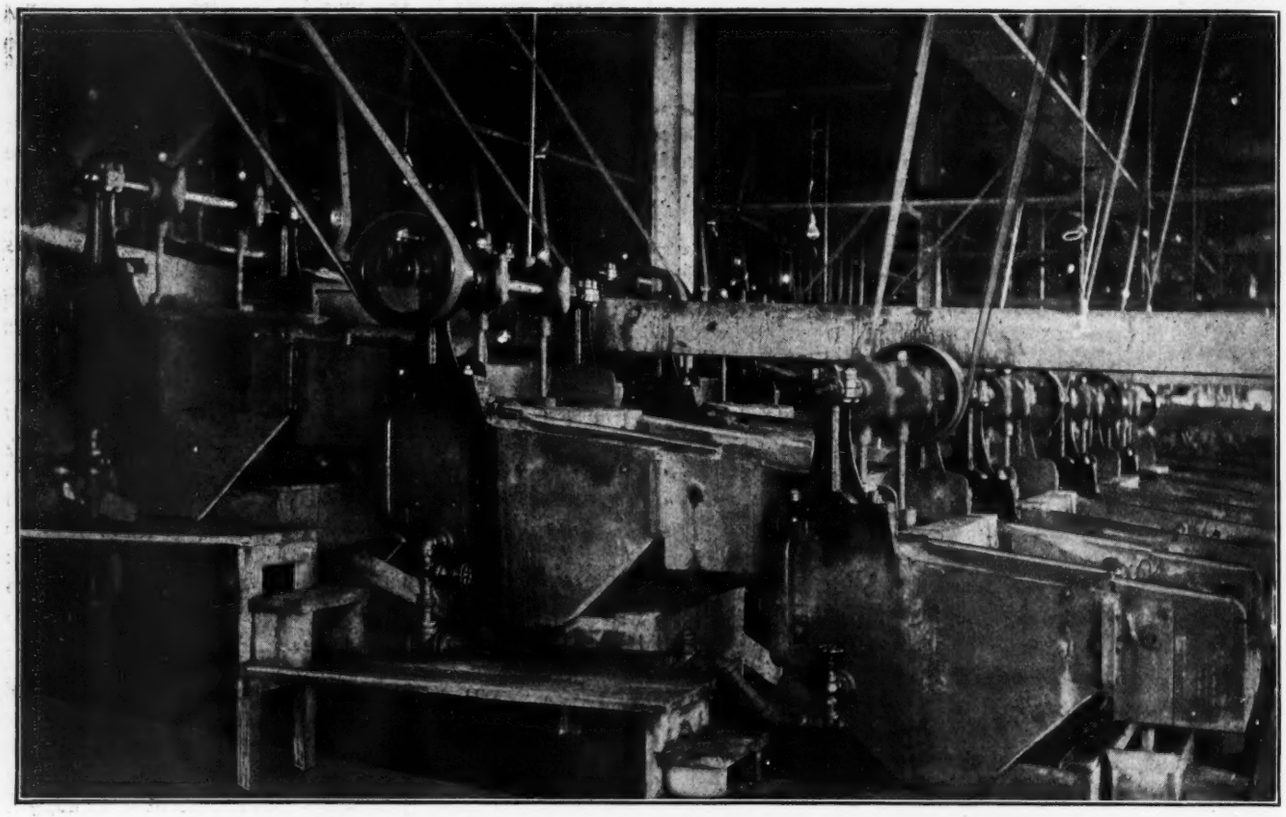
It is reported that a government extension provides for an increase in the Swansea spelter works to deal with a further 100,000 tons of concentrates, which is equivalent to about 38,500 tons of spelter. This would give an approximate capacity of about 100,000 tons of spelter, or one-half of the annual consumption in the United Kingdom. In November, 1916, the Agents General of Australia visited Swansea to inspect the smelting works with the object of finding a market within the British Empire for Australian zinc concentrates.

Previous to the war Germany, Belgium, the Netherlands, and the United States were the largest producers and exporters of spelter. During the war the United States has become the chief source of supply, resulting in a greatly increased production and export trade.

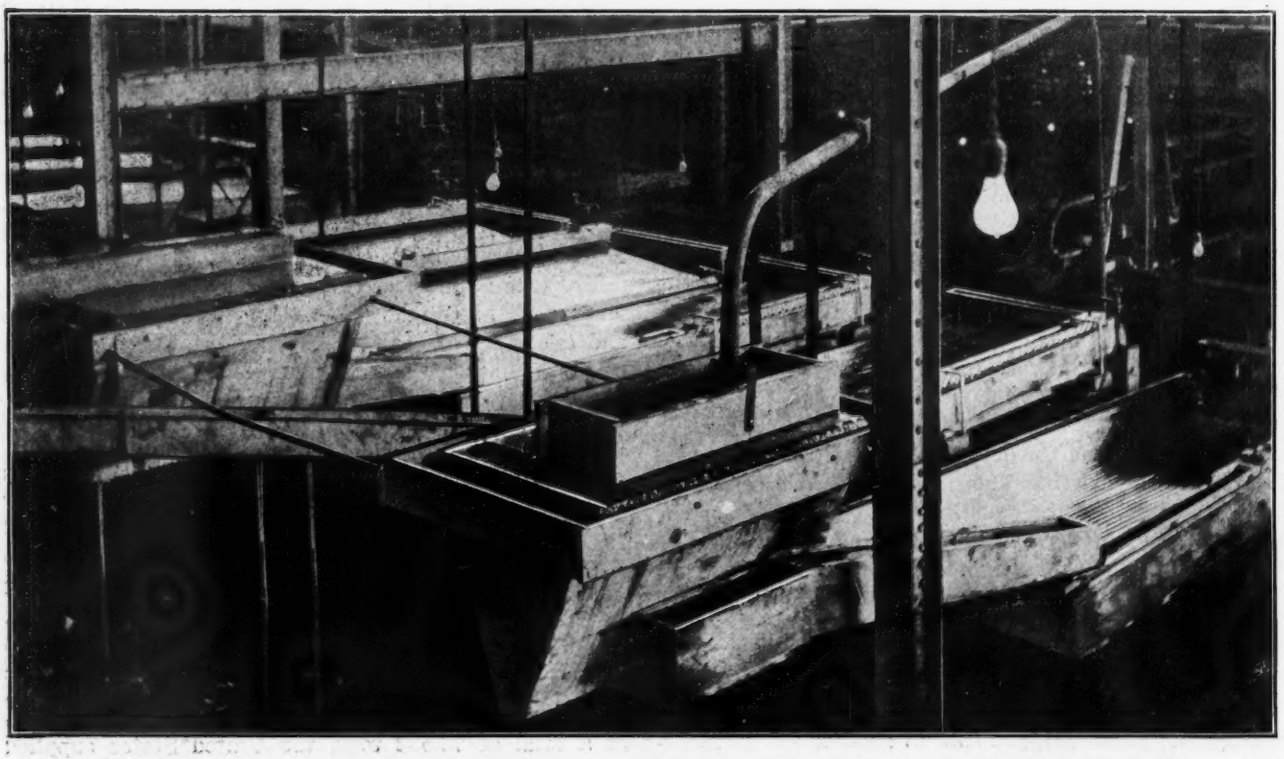
More zinc ore has been imported into the United Kingdom since the outbreak of war—64,670 tons in 1913 and 114,360 tons in 1915. Italy sent 13,801 tons in 1913 and 37,055 tons in 1915; Australia, 16,772 tons in 1913 and 38,883 tons in 1915.

Imports of crude zinc in cakes decreased in 1915, as compared with 1913, by almost one-half. In 1913, out of a total of 145,004 tons of crude zinc cakes imported into the United Kingdom, 117,679 tons (80%) came from Belgium and Germany, as compared with only 4670 tons (3%) from the United States. In 1915, out of a total of 74,522 tons, the United States supplied 46,276 tons (62 per cent.).

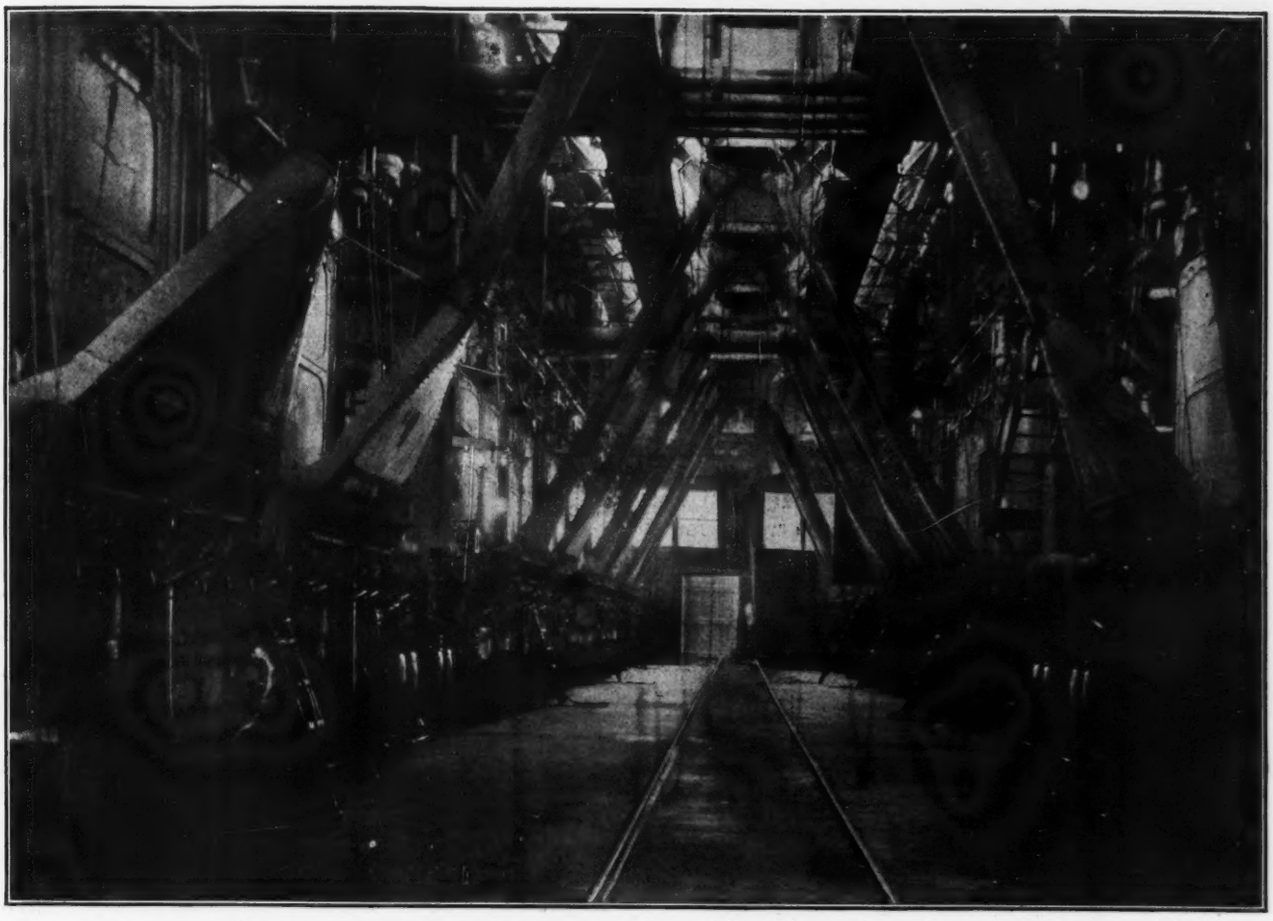
Views from Michigan Copper Country



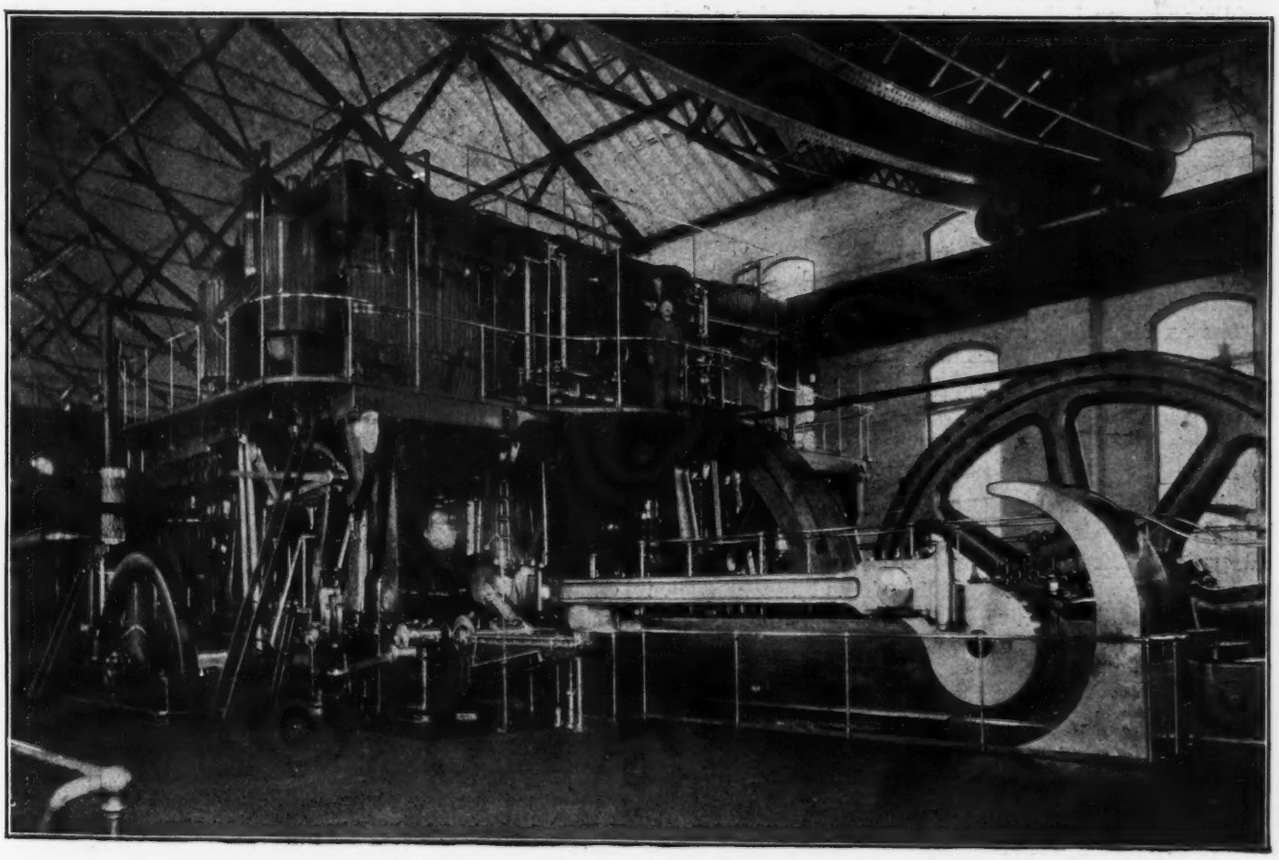
JIG FLOOR AT STAMP MILL OF CHAMPION COPPER CO. AT FREDA, MICH.



FEED DISTRIBUTOR FOR CONCENTRATING TABLE IN THE STAMP MILL OF CHAMPION COPPER CO.



MECHANICAL STOKERS IN POWER HOUSE OF THE CALUMET & HECLA STAMP MILL



TRIPLE-EXPANSION HOISTING ENGINE AT RED JACKET SHAFT, CALUMET, MICH.

Correspondence and Discussion

Chemicals Used in Flotation

The *Journal* of Oct. 27 contained a paper credited to Messrs. Ralston and Yundt regarding "Chemicals Used in Flotation." The paper is highly educational and interesting and indicates practical knowledge. I would call attention to the subdivision "Manganates and Chromates Are Used for Differential Flotation." Here the authors, after stating the facts regarding the practice, discuss the costs and suggest a means of preparing the manganates, which suggested method I consider in error and misleading. A similar error is found in German literature with a considerable number of incorrect statements regarding the manufacture of manganate salts.

Let us assume that the permanganates are under discussion as the oxidizing agent desired, as they carry the double oxidizing power and are stable where the simple manganate salts are unstable except in strong alkaline solutions. The potassium salts alone give the convenient crystal form, and no sodium salt or evaporated powder can be prepared without, say, 30% or more of alkali or NaOH present. Manufacture of permanganate salts was formerly exclusive with Germany, with a price per pound of potash crystals under 25c. Since the war prices have jumped to $4 or a little less for sodium-permanganate solutions of equal oxidizing power, but carrying a large proportion of soda salts as chloride or sulphate of soda. This sodium permanganate is made in New York and used in mill and Government work as a temporary expedient until a better product can be obtained. The method of manufacture used is what is called the chlorate method. This condition, and statements of manufacturing chemists who have seen German practice, warrant the conclusion that the manganate roast is a rather difficult operation and that German means and apparatus are impracticable and too expensive for American adoption.

The authors state that the fusion of manganese dioxide and carbonate of the alkali will produce manganate, presumably the simple manganate which could be oxidized to the per salt. Practically this statement is untrue, as the reaction, $MnO_2 + 2K$ (or $2Na)OH + O = K_2$ (or $Na_2)MnO_4 + H_2O$, shows that oxygen is essential, which the fusion act denies. It is academic that if a large excess of alkaline carbonate be used, adequate to form a fluid mixture with MnO_2 and the mass be heated to about 1000° C. and air be blown through the fluid mixture, one will get manganate. The operation is utterly impracticable in a technical or economic sense because of the temperature and the immense volume of alkaline carbonate or resulting hydrate entering the leached solutions (several times the normal amount) and defeating the permanganate act to follow.

The only practical result of a fusion of MnO_2 and Na_2CO_3, using the large excess of the caustic adequate to enable fusion, would be that on adding such fused product to a flotation bath MnO_2 would precipitate and the alkali go into solution. Even if the fused mixture were blown with air to form the manganate Na_2MnO_4 the flotation solution, not carrying a strong alkalinity, such as 5 to 7%, would decompose the manganate into MnO_2 and the alkali.

The statement of Messrs. Ralston and Yundt I consider incorrect, and impractical if it were true. With the German apparatus the oxidizing roast to manganate is exceedingly delicate and other apparatus has not been perfected to compete with the German in any practical sense. Because of the mis-statements made concerning manganate manufacture, I deem it best to correct the misunderstanding. I speak after having spent some months in the research of the subject.

Essex, Mass., Nov. 2, 1917. PARKER C. CHOATE.

Passports for Mining Engineers

Passports always have been a theoretical essential for traveling Americans, but mining engineers usually must start to far-off places on such short notice that, if it is feasible to depart without the official "ticket-of-leave," the privilege of carrying such a document is often waived. A country like Cuba, practically under the protection of the United States, an ally in the great war, and ordinarily as accessible as New Jersey or Brooklyn, would seem to be out of the passport class.

A call in person at the New York branch office of the Department of State yielded the information, from one clerk, that a passport is necessary to go anywhere outside of the United States. The first clerk being either too busy or not willing to respond to further inquiry, a second clerk was asked: "Has some special order been issued, on account of the war, making passport conditions for travelers to Cuba any different from last year?" The reply was: "Conditions are just the same. Passports have always been required. The only difference is that you can't buy a ticket now unless you have a passport."

The matter being urgent, an application was made at the Pennsylvania Station. A through ticket to Havana, Cuba, was sold without question, similar in every way to a ticket sold a year ago. Baggage was checked without inconvenience. The jolt came here at Key West, where an intelligent official of the Treasury Department gave the precise information that on June 22, 1917, a definite order was issued prohibiting the embarcation, on any vessel bound for a foreign port, of any passenger not provided with a passport issued by the government of his nationality. The order became effective at Key West on or about June 28, 1917. The moral is that it is unwise to accept the verbal statement of a subordinate Government clerk regarding any important matter. One should insist upon being shown the official text of any Government regulation interfering with one's life, liberty or pursuit of happiness. Beware the Government clerk!

WILLIAM B. MCKINLAY.

Key West, Fla., Nov. 18, 1917.

Mining in Russia

The editorial, "Mining in Russia," in the *Journal* of Nov. 10, was a brief but correct summary of factors acting against such meritorious enterprises in Russia as the Irtysh, Kyshtim, Ridder and Spassky; also on the general labor situation.

In mentioning a few engineers who had brought some of the world's greatest mines to their present stages you quote Hoover—T. J., I presume—as solving the Broken Hill treatment problem. This is unfair to Australians, who will protest when they read the belittling of their efforts in the past. For 20 years the clean separation of the lead and blende from the rhodonite gangue of the Barrier lode was a problem, and recovery of the lead, then mostly desired, was rarely above 70% from a 15 to 20% ore; this by gravity methods.

Early in the present century C. V. Potter commenced his experiments on flotation of Broken Hill ore, and in 1902 obtained a patent. In 1906 I saw his or the Delprat process working at the Proprietary mill treating 1000 tons of tailings daily. There was also the work by Delprat, De Bavay, Hebbard and others (during which time the Zinc Corporation—where Hoover was experimenting—tried the Elmore and many other processes) and later Horwood and Lyster, with their selective systems. At the Central mine of the Sulphide Corporation recoveries of metals by gravity and flotation concentration—processes devised by that company's staff—are now 94% lead, 91% zinc and 92% silver. Intermingled with all of this development was the vexatious litigation with Minerals Separation.

Honor to whom honor is due. Give Australians their due regarding flotation and other metallurgical innovations, adopted and used extensively throughout the world. M. W. VON BERNEWITZ.

New York, Nov. 15, 1917.

A Florida Rare-Mineral Deposit

An interesting article entitled "A Florida Rare-Mineral Deposit" appeared in the July 28 issue of the *Journal*. On p. 155 Mr. Liddell says: ". . . toward the last of the grinding operation the zircon suddenly swells greatly, disengaging large quantities of helium as it does so." In view of the fact that helium is rarer than the other substances mentioned in the article, greater prominence should have been given to a phenomenon that may presage a new and important source of radium. Helium is listed as an inert monatomic gaseous element occurring in the atmosphere of the sun and stars and in small quantities in the earth's atmosphere, in several minerals (especially cleveite, uraninite and bröggerite) and in certain mineral waters. It has a density of 1.98 as compared with hydrogen and is known as a decomposition product of the radium emanations. As a source of radium emanation zircon becomes more important than formerly. Curiosity will be aroused as to the means of detecting the Florida helium. That it may have emanated as a sort of smoky haze, like the products of combustion of a Tampa perfecto, is to be surmised from Moses and Parsons' "Mineralogy," fourth edition, 1909, p. 403, which says: "Colorless or smoke varieties are called jargon, and are comparatively worthless." According to Dana's "Descriptive Mineralogy," 1901, p. 486, some varieties of zircon are not only playful but exhibit a peevish lack of loyalty. A type found in Norway is called "tachyaphaltite," named from two Greek words signifying that it flies from the gangue when struck. Is the Tampa stuff jargon, or must the mineralogy textbooks be revised? T. MONTMORENCY DILLON.

Habana, Cuba, Sept. 15, 1917.

Geologists and the Oil Industry

It is only five years since the first geologist had the temerity to open a consulting office at Tulsa, Okla., the headquarters for oil operators in the great mid-continent oil field. Clients were few, in spite of the modest fees demanded and excellent work performed. The operators had migrated mainly from the old eastern fields, where geologists are still looked upon as little better than fakers and "oil-smellers."

After demonstrating the tremendous wealth in oil of the Cushing pool and its north extension, which were located by geologists, and the later success of the Doherty interests in Butler County, Kansas, which have always maintained a geological staff, most of the skeptical oil men reversed their opinions and became so pro-geologist that there are now over 3000 bona-fide and self-styled geologists in the mid-continent field.

The sudden demand for geologists created a following of pseudo-geologists, who formerly relied on magic wands, divining rods, Spanish needles and other devices of the quack for impressing the tenderfoot with their occult powers for locating oil pools. As yet the advent of the legitimate oil geologist is too recent for many of the operators to be able to differentiate between "the wheat and the chaff." In fact, the section is undergoing the earlier experience of Colorado, where the enchanted tenderfoot was prone to employ the so-called mining engineers who suddenly developed from carpenters, janitors, and black-legs at a time when an active but largely non-discriminating demand for "mining experts" arose in that mine-mad country.

There are today many able geologists in the mid-continent field, and many more younger men who, after they have had the requisite experience added to their recent college education, will develop into competent geologists. But today they are severely handicapped by the failure of the public to discriminate between properly trained, experienced geologists and the quacks who masquerade as such. This condition threatens the profession with a setback and while the situation in time will resolve itself, the profession for its own protection should leave no stone unturned to educate and warn the public against the folly of indiscriminately engaging any one who merely calls himself a geologist, and all should combine in eliminating the quack. It should be made evident that a smattering of highly scientific words or anticlinal lingo and the wearing of scientific instruments do not identify a geologist. Some of the members of the geological profession are not entirely blameless in adding to the growing distrust; they ride their hobbies to an extreme, sometimes fail to give a clear, broad-gage exposition of their conclusions and too often attempt to decide probabilities that are better left to the promoter or capitalist.

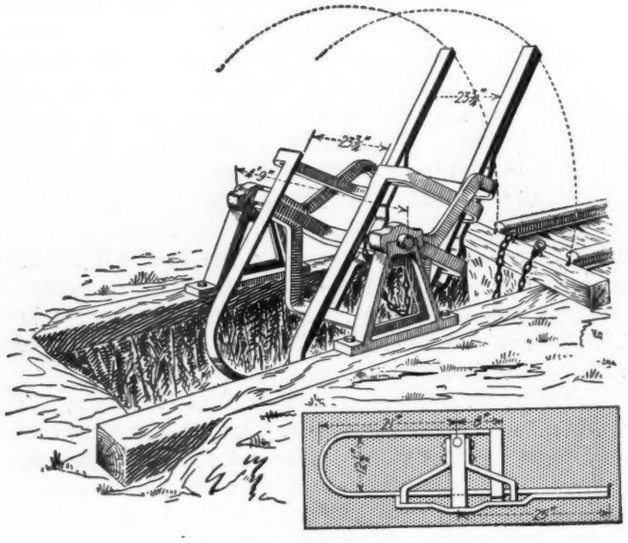
St. Louis, Mo., Nov. 1, 1917. H. A. WHEELER.

Details of Practical Mining

Automatic-Dumping Cradle

The automatic-dumping cradle for mine cars shown in the accompanying drawing is in use at the mines in the Southeast Missouri lead district. Cars used with a cradle of the dimensions given hold one ton and have a capacity of 22 cu.ft. They are of the rigid solid-box type, having an 11-sq.ft. bottom and sides 2 ft. deep; are equipped with Whitney Wonder roller bearings for a 24-in. gage and hauled in trains drawn by mule or motor, with simple chain-link couplings.

The cars are hand trammed directly into the cradle, or tipple, which at once overbalances, holding the car wheels to the tipple track and dumping the contents of the car into the chute or pocket below. Two chains bolted to the solid ground between track rails are fastened to the 3-in. square iron bar below the cradle. The angle of dump is checked by the length of these chains, which, upon tension, jerk the cradle and car back to a

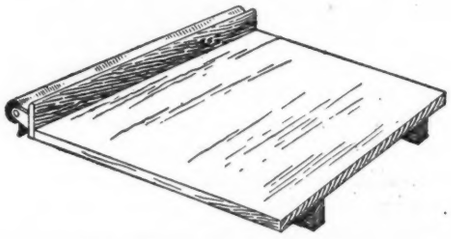


AUTOMATIC MINE-CAR TIPPLE

semi-normal position, at which point the carman takes hold and rights the car and cradle by drawing the car back to the main track. The center of gravity of the tipple when empty being low and back of its axis of rotation, causes the cradle to retain a level position. When a loaded car is run into the tipple the center of gravity becomes higher and moves to a point ahead of the axis of rotation making it overbalance so as to discharge the contents of the car. The discharge causes the center of gravity to approach the axis of rotation, and little effort is required to right the tipple and empty car. The system is rapid in dumping, has the advantage of utilizing cars without gates, levers or locks and eliminates the nuisance and delay incident to cleaning the track around the chute after each car is discharged. At shaft pockets where tipples are subjected to greater usage than at the various dumping chutes, the shock received by the bolts and chains as each car is dumped is lessened by the use of coil springs placed around the bolts in such a manner as to act as shock absorbers, allowing the bolts to be raised from their seats against the compression of the springs.

Drafting-Table Cover

I know of no more convenient cover for the drafting table than a roller shade, writes Oliver Martin in the *American Machinist.* It has the great drawback, however, that loose tracings are drawn into the roller occasionally and thus mysteriously disappear. In order



DRAFTING-TABLE COVER

to avoid this, I mount the roller shade on a strip of wood about the same length as the table; and this strip of wood I screw on the rear edge of the table. The upper edge of the strip should be from 2 to 3 in. above the top of the table. It does the trick—try it.

A "Miner's" Under-Reamer

Churn-drill operations in outlying districts with one rig are likely to cost more per foot of hole drilled than where several rigs are at work. This is due to the fact that it requires about as many spare tools and parts and special emergency tools or appliances for small operations as for large ones, and if sufficient provision is not made at the outset, the expense incident to delays in waiting for delivery when an emergency arises is a heavy tax on operations. Churn drillers and tool dressers are paid skilled-labor wages, and good ones are none too many. Men working in outlying prospects expect straight time whether they work or lie idle, and when three shifts of drillers are waiting for a new cable or special fishing tools, etc., for two or more weeks the chance taken by not being prepared in the first place is doubtful economy. "Necessity is the mother of invention," however, and invariably "there is always more than one way of skinning a cat."

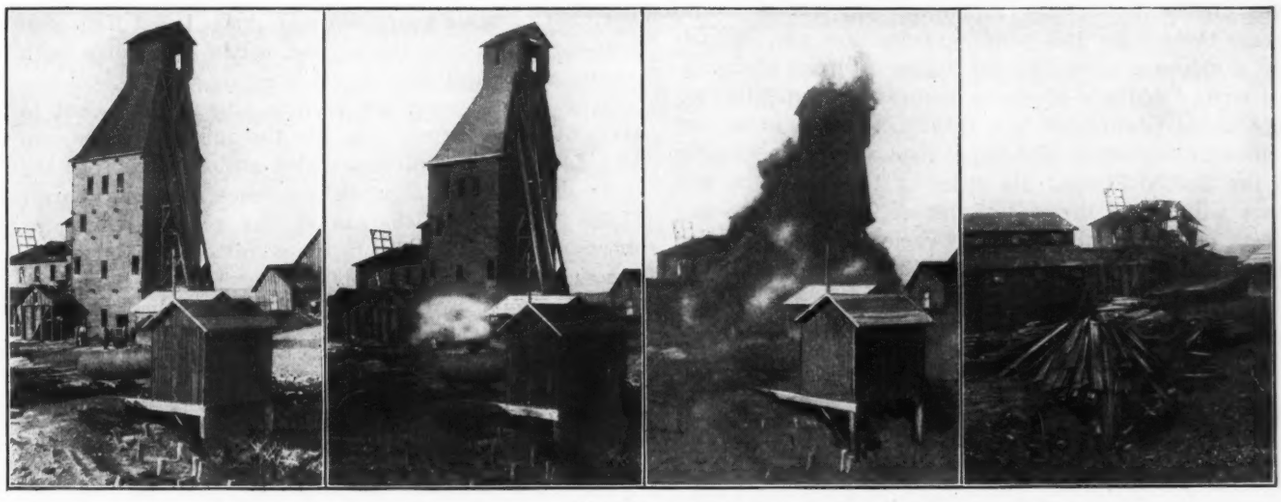
A few years ago in the underground development of a prospect in the Santa Catalina Mountains, Arizona, a No. 23 Star churn-drill rig was used. It was before the passage of the eight-hour law and the drillers worked in two 12-hour shifts. They were paid $6.50 and the helpers $4.50 per day and were getting straight time. Hole No. 2 had been drilled with a 10-in. Mother Hubbard bit to

a depth of 320 ft. when caving from above necessitated casing. The drillers could not make the 8¼-in. casing pass the 150-ft. point, owing to a deflection in the hole. Every method known to drillers was tried until one, who had been an oil-well driller in California, proposed sending to Los Angeles for an under-reamer. It was 80 mi. from Benson, a two days' wagon haul when the San Pedro River was not up, and this meant at best a two weeks' lay-off, with a cost of $22 per day against the footage drilled. Miners' experience, however, came to the rescue. A joint of 2-in. pipe was loaded with 40% gelatin powder and lowered by the bailing rope to the point of deflection and set off. The effect was to chamber the hole at the center of the curve and, after the operation had been repeated once or twice, the casing was lowered to the bottom.

Shooting a Shaft House

BY W. R. HODGE*

The wooden shaft house at the Burra Burra shaft of the Tennessee Copper Co. was erected about 1900 and was replaced last summer by a steel building. While the erection of the new building and incidental retimbering of 800 ft. of shaft was in progress, ore was hoisted through the McPherson shaft, at the north end of the mine. Hoisting ore from this shaft entails inconvenience and difficulties, and speed in reëquipping the Burra Burra shaft was consequently desirable.



SUCCESSIVE STAGES IN SHOOTING BURRA BURRA SHAFT AT DUCKTOWN, TENN.

Owing to the construction of the wooden shaft house it was impossible to place foundations for the new structure while the old one was still standing. The old building consisted of a main portion, which stood 110 ft. above the collar of the shaft, and railroad bins of 2000 ton capacity connected to the main building but structurally independent of it. It also contained the sheaves, crusher bin, crusher, picking belt and steam engine for driving the belts.

When the first steel for the new building arrived, about half of the railroad bins were abandoned and wrecked by hand, with some assistance from a small derrick. When all the steel for construction had been received, hoisting was begun at McPherson shaft and discontinued at the Burra Burra. The building was stripped of all machinery except the bare 15-ton frame of the crusher which, being immune to injury, was left in place. The crusher was 48 ft. above the collar of the shaft, and after the structure had been wrecked was found uninjured and almost directly below the position it had formerly occupied. Stripping the shaft house of machinery took about six shifts.

The main building was supported on four rows of 12 x 12-in. posts arranged symmetrically on the center line of the building so with two rows of these posts shot away simultaneously on one side, the building would lean and fall to that side—like a tree chopped two-thirds through. When the stripping of the building was complete the timbers connecting the main building with the bins were cut loose and the four stringers of the skipway were sawed square across. Then the two rows of posts on the south side of the shaft house were bored, 2½ sticks of 60% dynamite placed in each one and the holes well tamped with clay to insure a complete fracture of each post. Electric detonators in the dynamite were connected with a switch in the 220-volt lighting circuit of the mines and fired. The left center photograph was taken at the moment of this explosion. The building settled an inch or so to the south, but apparently was uninjured although inspection showed the dynamite had done the work expected, all the posts in the two rows being cut in two. Careful examination showed that the 12 x 12-in. stringers in the skipway were holding the building in place, and they, too, were shot out. The right center photograph shows the shaft house at the time of firing the second set of blasts. The house did not fall square to the south, as was expected, but partly to the southeast, squatting down on its foundations. A railroad crane was then put to work on the wreck, and in 14 shifts cleared the ground so that foundations could be started for the new shaft house. The crane also wrecked the remainder of the railroad bins, by wrapping a chain around sections and pulling, thus rolling the timbers from their foundation.

*Mining engineer, Tennessee Copper Co., Ducktown, Tenn.

Cost of the Cornish Pumping Engine at the Chapin mine, Iron Mountain, Mich., excluding installation cost, was $120,600. The cost of the pumping engine itself was $85,600; the cost of the pumps in the shaft, $30,000; and the cost of a power winch was $5000. This was used only for installing the pumps in the shaft.

Events and Economics of the War

A sudden thrust of the British on Nov. 21, without artillery preparation, penetrated the German lines before Cambrai to a depth of 6½ miles; barriers were leveled through the use of tanks; most of ground was held and open fighting for the possession of Cambrai is in progress. Small gains elsewhere were claimed by the British near Ypres and by the French in the Aisne sector and at Verdun. The Italians continue to hold the Piave line and have so far defeated all efforts to flank their left on the Asiago Plateau. In Petrograd the Bolsheviki still control; Lenine has sought to disband the Russian armies at the front; Trotzky, posing as foreign minister, has published alleged secret agreements of Russia with the Allied governments. Germany has extended her "war zone" at sea to include the Azores. The British House of Commons voted to disenfranchise the "conscientious objectors" to war.

In this country, the railroad brotherhoods have placed their demands for higher wages in the hands of the President. The railroads have likewise asked permission of the Interstate Commerce Commission to increase their rates and, pending a decision, are conducting a vigorous campaign for higher railroad efficiency. All enemy and ally-of-enemy insurance companies, except those dealing in life insurance, have been forbidden by Secretary McAdoo to continue their business in the United States. By order of the President, soldiers will guard the waterfront of New York to bar access of enemy aliens to the various piers. Similar action will probably be taken at other vital points.

To Pool Eastern Roads

Beginning at once the Eastern railroads of the country, comprising 25% of the total mileage and doing 60% of the business, are to be operated as one single railroad system by a committee made up of the operating vice presidents of the roads involved, under the direction of the Railroads' War Board. The outstanding features of the plan of operation and its ramifications are, according to the *Sun*, as follows:

The Government tacitly consents to a virtual abrogation by reason of war necessities of the section of the Interstate Commerce Act making it unlawful for any common carrier to enter into any contract or agreement for the pooling of freights.

That through this action there will be combined in one railroad system 65,000 miles of railway with 1,194,000 cars and 677,000 employees.

That the present system under which shippers can route their own freight is about to be discontinued, all this being placed in the hands of some central authority acting for all the railroads, this agency to designate over what routes, private as well as Government, shipments shall move.

That an immediate development will be a classification of non-essential freight to be moved when possible or to be placed under an absolute embargo if conditions make this necessary.

That passenger schedules will be greatly changed and curtailed, particularly the through schedules, with the possibility that on some roads through passenger traffic will be eliminated, that they may be used more extensively as freight lines.

After Three Years in Great Britain

Reviewing the three past years of war on the third anniversary of its outbreak, and after pointing out the long series of unfulfilled prophecies and shattered expectations in the political and military field, the London *Stock Exchange Gazette* says:

"Events in the domain of finance, high and low, have not followed the course expected. When the war broke out, there was a good deal of unconcealed apprehension regarding the ability of this country and its allies to stand the financial strain of a world-wide and prolonged war. After three years, we may justly boast that, stupendous as has been the burden, it has been borne with consummate ease.

"The cost of war, not only to this country, but to every other belligerent, has, like the duration of the conflict, far surpassed all reasonable anticipations. In the early days of the struggle we were spending barely £1,000,000 a day, whereas at the present time our average daily outlay, inclusive admittedly of large advances to allies, is about £8,000,000. Yet this huge obligation is being provided for without paralyzing either the finances or the industries of the country. An almost unthinkable load of war debt has involved a corresponding addition to the burden imposed on the taxpayers of the country, and today the national revenue is more than 200% greater than it was in the last year of peace. We have done more than pursue the safe and sound policy of providing out of fresh taxation the means wherewith to pay interest and sinking fund charges on war debt, for we have furnished year by year, out of current revenue, a substantial contribution toward the cost of naval and military operations.

"Despite the enormous additions to the taxpayers' burdens, the country still flourishes, both in a financial and an industrial sense. When, on the eve of the outbreak of the war, the Bank of England's reserve of gold was well-nigh exhausted and the official rate of discount was put up to 10%, there was a very widespread impression that a financial collapse was inevitable. But the crisis was adroitly handled. The Bank of England's stock of gold, which had sunk to £27,622,069 on Aug. 1, was quickly reinforced, and rose to an unprecedently high figure within a few months. This summer it stood at £53,128,645, or a level well in excess of its pre-war average.

"Three years ago it was thought that any war, but especially one of such duration and magnitude, would

seriously weaken all our great financial institutions. Today, on the contrary, our banks, our insurance companies, and our various types of financial corporations, are stronger than ever, thus testifying not only to the solid and secure foundations on which they are built, but to the foresight and prudence of those responsible for their direction.

"In the world of industry and commerce, too, the calculations of August, 1914, have for the most part been rudely upset. At first the prevailing note was one of marked, and, as it subsequently proved, unjustifiable timidity. Many joint stock companies which ought to have known better either nervously postponed the declaration of dividends, or when declaring them deferred their payment to a subsequent occasion. The result was the infliction of quite unnecessary hardship on thousands of investors throughout the country. But the crisis once passed, wiser counsels prevailed, and companies began to distribute freely the profits at their disposal.

"In the commercial and industrial world uncertainty and some anxiety prevailed at the outset, but they soon gave place to confidence, and the popular cry for a time at least was 'Business as usual.' Everything in all trades was to go on as before, and incidentally the commercial energies of the country were to be concentrated on the capture in neutral and Allied markets of Germany's lost commerce.

"But it was very soon discovered that business as usual was, in many directions, an impracticable ideal. Trade took a natural, though generally unforeseen, course. Some industries suffered acutely; others flourished exceedingly. Those engaged in the production of luxuries were hard hit, and will probably not recover from the blow until long after peace has been signed. On the other hand, industries concerned in the production of articles used in the prosecution of the war and those that minister to the wants of the masses have for the last three years been having the time of their lives.

"Engineering enterprises, manufacturers of textiles and clothing, makers of explosives, coal, iron, and steel undertakings and shipping companies, have been making profits undreamt of in peace times. The state has laid them all under a heavy toll in the shape of an excess-profits duty, but even after meeting that onerous impost they are still able to pay dividends which should satisfy the aspirations of the most exacting investor.

"After three years of war, then, the general position may justly be described as surprisingly satisfactory, and the whole nation can await with composure the events of the coming 12 months."

Germany Rules on American Property Held in the Empire

The official *Reichsanzeiger* (Berlin) announces that the ordinances dated Oct. 7, 1915, governing compulsory notification to the authorities of foreign property in Germany have been extended, together with the penalties in cases of noncompliance, to property owned by citizens of the United States, as from Nov. 20, 1917. The term "property" includes shares in German enterprises within the empire and legal claims upon persons domiciled within the empire. Transfers of such property or claims are permissible only by the Chancellor's express sanction.

The ordinance has a retroactive force if it can be shown that the transfer was made earlier with the purpose of evading the new regulation. It does not apply to property owned by citizens of the United States residing in the empire.

The immediate purpose of the compulsory registration is to prevent the illegal transfer or liquidation of American property held within the limits of the German Empire for the purpose of removing the same from official control and conveying its proceeds abroad. Such transfer or liquidation is allowed only when specific permission is granted.

These restrictions do not apply to such disposition as Americans may desire to make of their property within Germany. They, however, are not permitted to sell their holdings to a resident member of a firm in this country without specific permission. American manufacturing plants are not molested, and Americans resident in Germany may also continue freely to dispose of their private means within the confines of the country.

The official announcement states that the compulsory liquidation, or the administration of the property of American firms, is not contemplated, as it is presumed the provisions of the "Trading-with-the-Enemy Act" do not purpose the sequestration or confiscation by the American Government of German property held in the United States.

Important Features of Army and Navy Insurance Law

A division of military and naval insurance of the Bureau of War Risk Insurance has been organized as a part of the Treasury Department and is in operation. A large number of policies on the lives of soldiers has already been issued. The benefits of the law are available to all members of the United States Army, Navy, and Nurses' Corps. Applications for such insurance must be made by Feb. 12, 1918, or else they will be barred, according to a recent announcement by Secretary McAdoo. A summary of some of the main features of the law follows:

Premiums for a $10,000 policy begin with $6.30 per month at ages 15, 16 and 17; increase to $6.40 per month for the ages 18, 19 and 20; to $6.50 per month for the ages 21, 22 and 23; to $6.60 per month for the ages of 24 and 25; to $6.70 per month for the ages of 26 and 27; to $6.80 per month for the age of 28; to $6.90 per month for the ages of 29 and 30; to $7 per month for the age of 31, with progressive increases for ages above those given. The minimum amount of insurance that may be taken out is $1000.

The compulsory allotment to a wife or children, which is separate from the insurance, shall not be less than $15 a month, and shall not exceed one-half of a man's pay. A voluntary allotment, subject to regulations, may be as large as the insured desires, within the limits of his pay. In addition, the Government will pay monthly allowances as follows:

Class A. In the case of a man to his wife (including a former wife divorced) and to his child or children: If there be a wife but no child, $15; if there be a wife and one child, $25; if there be a wife and two children, $32.50, with $5 per month additional for each additional child; if there be no wife but one child, $5; if there be no wife but two children, $12.50; if there be no wife but three children, $20; if there be no wife but four children, $30, with $5 per month additional for each additional child.

Class B. In the case of a man or woman, to a grandchild, a parent, brother or sister: If there be one parent, $10; if there be two parents, $20; for each grandchild, brother,

sister and additional parent, $5. In the case of a woman, to a child or children: If there be one child, $5; if there be two children, $12.50; if there be three children, $20; if there be four children, $30, with $5 per month addditional for each additional child.

If the man makes an allotment to certain other dependent relatives the Government will also pay them an allowance which may equal the allotment, but this shall not be more than the difference between $50 and the allowance paid to the wife and children. The increased compensation in case of death runs from a minimum of $20 monthly to a motherless child, or $25 monthly to a childless widow, to a maximum of $75 monthly to a widow and several children. The widowed mother may participate in the compensation.

In case of total disability the monthly compensation runs from a minimum of $30, if the injured man has neither wife nor child living, to a maximum of $75 if he has a wife and three or more children living, with $10 a month extra if he has a widowed mother dependent upon him. The maximum is enlarged still further when the disabled man constantly requires a nurse or attendant, in which case $20 monthly may be added. If the disability is due to the loss of both feet, both hands or total blindness of both eyes, or if he is helpless or permanently bedridden, $100 monthly is granted.

The law contemplates future legislation for reëducation and vocational training for the disabled. It gives them full pay and their families the same allowance as for the last month of actual service during the term of reëducation.

I. W. W. Round-Up in Kansas

State and Federal officials began a round-up of members of the I. W. W. throughout Kansas on Nov. 21. More than 100 persons were arrested in the Butler County oil fields as a result. Of these over 50 remain in custody, including O. E. Gordon, Alfred Barr and Samuel Forbes, who are known to be national officers of the I. W. W. organization. Lodging houses and buildings used as meeting places were invaded. Attention was then turned to the Towanda field. Citizens aided the officials, who were armed with John Doe warrants. In cases where there is not sufficient evidence against the men to support prosecution by the Government, charges of vagrancy will be preferred.

The round-up was in charge of Oscar Schmitz, working as a special agent under the Bureau of Investigations. Reports from the oil fields that the I. W. W. intended to resort to violence were responsible for the Government's action.

Ten Tons of Aluminum in a Zeppelin

According to notes furnished to a London journal by a French officer, in the construction of the framework of a Zeppelin from 10 to 12 tons of aluminum is employed. The covering of the 18 balloons enclosed inside the big outer envelope is made of a cotton substance, lined with "goldbeater's skin," instead of with rubber, and the quantity used is so large that the intestines of 30,000 cattle go into the material for one Zeppelin.

Each of the 18 balloons is fitted with a valve, and separated from those on each side of it by a funnel to carry off the explosive mixture of the hydrogen of the balloons, the oxygen of the air, and the gases given off by the engines. When all five motors are working together—one contained in the forward car, one in each of the two side cars, and two in the rear car—the speed attained is 68 miles per hour, but, as a rule, all the engines are not used at one time, and the normal rate of flight is from 50 to 56 miles per hour. The ordinary crew consists of 22 men, but during raids a crew of only 18 men is carried.

Coal Producers Pool Output

The Fuel Administration has approved a producers' pool just formed at Cleveland which will handle shipments of coal mines in Ohio, West Virginia, a part of Pennsylvania and perhaps Tennessee and Kentucky. Creation of other pools will be encouraged. If Government pooling is put into effect it will be made operative next spring and will supersede the shippers' pools, the Government requisitioning at the mines the entire output of coal and selling it without profit.

Oklahoma coal operators have been threatened by Fuel Administrator Garfield with Government seizure and operation of their mines if they permit production to halt pending action on their demand for higher prices. The producers had notified Dr. Garfield they could not pay wage increases asked by the miners unless they get more than the 45c. a ton increase granted by Dr. Garfield, and that they would not make the wage increases retroactive to Nov. 1, as directed.

Dr. Garfield requested the Priority Board on Nov. 22 to revoke, effective after Nov. 30, the order requiring all coal shipments from Middle West fields to go through to the Lakes for trans-shipment to the Northwest. The purpose is to divert the coal to relieve acute shortages in the Middle West and New England.

Need Only Ten Billions More This Fiscal Year

Government expenditures are running far below estimates given to Congress, according to Secretary McAdoo, who predicted that the amount of money still to be raised for the fiscal year would not exceed $10,000,000,000. He said:

Vague and unfounded apprehensions seem to exist in the public mind as to the extent of the financial requirements of the United States during the current fiscal year. It may be helpful to the country to know that these requirements have been greatly exaggerated, and that in the judgment of the Secretary of the Treasury there is no reason whatever for apprehension on this score. This opinion is based upon the latest estimates of our financial needs.

During the last few days the various departments of the Government have submitted to me their estimates of expenditures during the current fiscal year. On the basis of these estimates I am confident that, allowing for a liberal balance in the general fund at the close of the fiscal year, not more than $10,000,000,000 remains to be raised by the issue of bonds, war-savings certificates and Treasury certificates of indebtedness. This is not regarded by the Treasury Department as a task which will in any way strain the capacity or resources of the United States.

France To Demonetize Some of Its Silver Coins

The French government has decided to demonetize certain types of silver coins, says the *Matin*, to put a stop to the hoarding which is paralyzing trade. When 15,000,000 nickel coins were struck by the mint all vanished virtually as soon as issued. The hoarding craze is especially prevalent in the provinces. To force out the hidden money, Finance Minister Klotz plans to demonetize all silver coins bearing the effigy of Napoleon. On Nov. 22 he issued a circular announcing the Government's intention and pointing out that the intrinsic value of the silver in the coin is only 67% of its nominal value.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Use of Domestic Manganese Hinges on Smelting Problem

The expansion in the mining of manganese ores since the war began is characterized as nothing less than remarkable by W. C. Phalen, of the staff of Dr. Charles L. Parsons, the head of the mining-technology division of the U. S. Bureau of Mines. Mr. Phalen has visited every important manganese-producing region of the United States in the last year. During the last five months he has made a survey of the manganese resources of the West.

While hundreds of holes have been opened and domestic production has been forced to a higher point than believed possible a few years ago, certain metallurgical problems must be solved to make available the large reserves of highly siliceous ores if the country is to become independent of foreign supplies. The large reserves of rhodocrosite in the Butte district, in Montana, and to a less extent in San Joaquin County, California, particularly impressed Mr. Phalen with the necessity of attempting in metallurgical practice to use these as well as large deposits of high silica manganese ore in certain of the Western states.

Characteristics of Carbonate Orebodies at Ophir, Utah

In connection with his study of the zinc-carbonate and related copper-carbonate ores at Ophir, Utah, G. F. Loughlin has expressed the following opinion upon economic features:

It is to be expected that bodies of lamellar zinc carbonate like those at Ophir will prove to be of high grade, owing to the complete removal of limestone, but of small dimensions and confined to the immediate vicinity of fractures and open bedding planes. Such small bodies are not likely to lead to larger bodies of massive ore, unless they lie near to ground-water level, or to some impervious stratum or fault that impounded the waters containing the oxidized compounds of zinc.

In districts where mixed sulphide deposits in limestone contain both copper and zinc in considerable quantity the resulting carbonate ores of both metals are to be expected in the oxidized zone, the copper carbonate immediately below the position of the original sulphide body or its siliceous casing, and the zinc carbonate below the copper carbonate. The details of these relations, as well as the richness and size of the carbonate bodies, depend on such local factors as the purity and permeability of the limestone replaced and the relative openness of bedding planes and fractures, which must be determined for each deposit or group of deposits.

Survey Fails To Discover Platinum

After the most careful survey that ever has been made of existing and possible sources of platinum, the geologists of the U. S. Geological Survey are convinced that there is no domestic occurrence of the metal justifying a large mining operation. With the situation in Russia doubtful, with obstacles in the way of obtaining the Colombian output and with domestic production certain not to exceed 1000 oz., it is not improbable that American women will be called upon to surrender their platinum jewelry to supply the needs of the rapidly expanding sulphuric-acid industry.

The Russian production in 1916 was one-third that of 1915. No estimate can be made of the quantity produced in 1917, but it is reported to be small. The spread of revolution throughout Russia, it is thought, will cause banks and speculators there, who have been holding platinum for higher prices, to disgorge. Some are of the opinion that unexpectedly large supplies of platinum soon will come on the market as a result.

To Safeguard Labor During War

In orders just issued by the chief of ordnance and by the quartermaster-general to arsenal commanders and to manufacturers engaged in Government work, the following comment is made.

In view of the urgent necessity for a prompt increase in the volume of production of practically every article required for the conduct of the war, vigilance is demanded of all those in any way associated with industry, lest the safeguards with which the people of this country have sought to protect labor should be unwisely and unnecessarily broken down. It is a fair assumption that for the most part these safeguards are the mechanisms of efficiency. Industrial history proves that reasonable hours, fair working conditions and a proper wage scale are essential to high production. During the war every attempt should be made to conserve in every possible way all of our achievements in the way of social betterment.

Explosives Law Hampers Employment of Austrian Miners

Every effort is being made by the explosives section of the U. S. Bureau of Mines to prevent loss of production as a result of the enforcement of the explosives law. There is no way, however, of permitting Austrian miners to be licensed. Miners of that nationality may be employed where shot-firing systems are used or where the explosive is issued by a licensed foreman. In cases where this arrangement is not possible, it is believed that Austrian employees can be transfered to work in which they are not required to use explosives, without any important interference with mine production.

Car Shortage Increases

If the cars now delayed in the congested region east of Chicago and north of the Potomac River could be released, a large part of the unfilled car orders could be taken care of, the Railroads' War Board reports. Car requisitions that could not be filled amounted to 140,-012 on Nov. 1. This is an increase of 25,104 cars as compared with the situation on the corresponding day of 1916. More than half of the unfilled orders are from parts of the country outside of the congested district.

Editorials

Railway Freight Rates

AT AN early stage in the present war, J. R. Finlay indicated, in a paper read before the Mining and Metallurgical Society of America, that the country or army with the greatest developed mineral resources at its command would probably win the war. In that paper he pointed out the predominating place that fuel, iron and steel were already occupying in military decisions, and how the control of these and other mineral products would ultimately spell ruin to the side whose raw materials were inadequate for present methods of war. Germany realized this fact, and this was undoubtedly one of her main reasons for quickly taking and holding the coal and iron fields of Eastern France and the coal fields of Belgium. This discovery has been made in the United States several times since Mr. Finlay wrote of it. Each time it has been elaborated upon by its new discoverer and some prominence given the matter in the daily press, until finally, and since the war has come home to us, we are all more or less imbued with the idea that a most important part of our present undertaking is that of getting out of the ground every pound of metal and coal that we can and *the transportation of these as quickly as possible to the point where they may be used* for some purpose more or less directly connected with the war.

With developed mines in plenty, with men to work them, with plants for treating the output and mills for converting product into merchantable form, what do all these avail if our means of transportation between mine and factory are inadequate? The chain is no stronger than its weakest link.

As we look about us today, few have the means of seeing or the ability to comprehend the intricacies and magnitude of the great war machines that our Government is trying to put into operation, but most of us are daily reminded of the fact that our railways are not equal to the task that they are asked to perform. Who or what is to blame for this condition and how is it to be rectified, for it must be rectified or we have already reached the limit of our capacity?

A long, long time ago—most of us were then little children—when railways made their tariffs what the traffic would bear and wage scales were determined by the law of supply and demand, main lines spread their tentacles into prairie and mountain; new lines were conceived and were paying dividends before they were completed. Many were poorly located, of course, and failed, but, generally speaking, railway building and operating were immensely profitable and there was always money for the track and equipment of any reasonable project, and mines had cars in which to move their product. Congested terminals, roads blocked with traffic, embargoes on freight, shortage of cars and fuel were not causes of complaint. To be sure, the railways took the most of what the consumer paid for his supplies, paying it out in dividends or putting it back into more rails and equipment. This was our complaint; the railways were robbing us, and they must be regulated. It was no idle dream, the railways *did* take all that they could get, much more than they should have taken, but regulation has proved to be not only a dream but a nightmare. If ever the term boomerang was appropriately used it was what the shippers got when they got the Interstate Commerce Commission, with the powers that it has so injudiciously used. Shall we, then, place the blame for our present inadequate facilities upon the shoulders of the Interstate Commerce Commission and the various intrastate railway commissions and let it go at that? Scarcely. We, the people who ship over the railways and the consumers of produce asked for the appointment of these commissions, asked that they be given power and asked that most drastic regulations be enforced. Then we, or our attorneys, appeared before the commissions and submitted proofs of mismanagement and gross overcharges. They were *our* commissioners and they appear to have believed most of what was told them. Railway officials appeared and presented their side and the side of the stockholders, but many of these gentlemen had been connected with more or less shady practices in the past and consequently their statements were taken with a grain of salt, no matter how penitent they might have been. The railways were regulated in a manner according very nearly to the idea of the shippers and the consumers. There was one group of men who knew what this regulation would result in; namely, railway financiers, managers and operators, numerically a small group, whose warning and advice were not heeded.

The railway management is responsible for present conditions only to this extent: During a certain period of railway building and operation it maintained the rights or the power of the railways above the rights of the people. A reaction was bound to follow and did follow, but the reaction was allowed to continue until the railways have actually suffered, until we are actually suffering ourselves, until we have put the biggest stumbling block possible in the way of winning our nation's greatest undertaking, and this is attributable only to our own selfish short-sightedness and ignorance. We have been a long time learning this, and war conditions are only accentuating what 90% of us knew several years ago and what we all, Clifford Thorne excepted, know now.

If we realize that a deplorable condition exists, if we understand what forces, what power brought this about, and we surely do, the next thing to be done is to use that power to bring back the pendulum to the zero point. It is our privilege and duty to say to the interstate and intrastate commissions: "We were wrong, and you have gone too far. Some of the statements of managers must have been nearer right than ours. Reconsider what they have told you, and henceforth act as arbitors

to bring about the greatest good for the greatest number regardless of the fact that you may put some of us out of business, out of business that existed only because we were a favored few."

But what has all this got to do with mines, miners, operators, producers of fuel minerals and their products? Why should we miners and metal men give this subject special consideration? We have a great deal to do with it. This war will be won or lost through the ability or inability of the railways to keep our product moving. It is all-important to us, from our own selfish standpoint, and all-important to the nation, that we use every effort and influence to keep our coal and metals moving.

Increased railway facilities are a personal necessity to many of us; they are a national necessity. We need both tracks and equipment vastly in excess of the present supply. This is not a time to debate as to the best source of money for supplying railway needs, the return on the investment, etc. We know that the railway should be in a position to pay the same rate of interest on the money it requires as would any business of equal safety or risk, no matter from what source it borrows. The railways are not paying that interest now and can only and should only get capital when they can vouch for an adequate return. An increase of income is the *sine qua non* of the present railway situation.

Railway income is practically all acquired from traffic and freight, in proportion one year being about the same as another, and of the freight nearly half is derived from the transportation of products of the mines. The Bureau of Railway News and Statistics, summarizing the figures for the year ended June 30, 1914, gives the following figures respecting the sources of income for the railways of the United States: Passenger traffic, 22.88%; product of mines, 35.44; manufactured articles, 10.58; forests, 7.66; agricultural products, 7.43; merchandise, 2.99; miscellaneous freight, 2.63; animals, 1.90; miscellaneous sources, 3.72; express, 2.47; mail, 1.90%. This gives some idea of whom it is that the railway serves and who it is that pays the largest percentage of railway freight charges and why it is that the producers of raw minerals are so deeply interested in the prosperity of their chief ally, the railways.

Today there are probably not half a dozen of the important mines in the United States but are waiting for some machinery or delayed supplies or that have not trouble in making shipments. We have been inclined to congratulate ourselves on obtaining a 10% reduction in freight rates and then another 5% and possibly another; but today, as we are waiting for cars or supplies, we see that we were not the recipients of unalloyed benefits. We realize that there have been too many reductions.

Like lead poisoning of the human system, we have been administering a sort of cumulative dose to the railways. We made complaints and got reductions. No bad effect was noted in the railway. We appreciated our gains. We repeated with the same result, and did it again. Finally we have seen that there were some ill effects not previously noted. But we cannot give the railway a dose of physic and bring it quickly back to its earlier vigor. We have got to begin and treat it decently and make our neighbors do the same. We cannot turn over to the railway money that it should have had and used but which we have paid our stockholders, but we can see that its freight rates are brought up to a point where they will yield the fair profit that the road should have. No, we cannot do all of the repair work ourselves, even though we do pay the most of the railway bills, but working through proper legal channels we can do our bit, which should be a large bit toward the repair of the link we have helped to weaken in the chain in our national economy.

What Zinc Smelters Ought To Do

IF ANYBODY had said four years ago that the price for common spelter would be about 8c. per lb. and that producers would nevertheless be complaining that they could not get a new dollar for an old one, he would have been promptly and properly pronounced a lunatic. However, what would then have seemed so utterly fantastic is a grim and serious reality now. The explanation is that all industry is on a basis multiplied by about 1.6 (probably more than that in the case of zinc) in so far as cost of production is concerned, and a price of 8c. for spelter now is no better than 5c. in 1913, and probably not quite so good. As compared with the first quarter of this year, the production of spelter has been reduced from a monthly average of about 65,000 tons to a rate of about 50,000 tons at present. Many smelteries are being operated at only partial capacity; many have been closed; some have been abandoned.

Now, it is useless for zinc smelters to delude themselves with any hopes of a return of the fat times of 1915-16. The competition among themselves and their great surplus of smelting capacity will prevent that; in short, natural conditions. About the only chance for a return of unnatural conditions that might favor the zinc smelters is that the War Industries Board may monkey with things that ought to be let alone. But assuming that Washington displays commonsense and keeps its hands off, there is no need to waste sympathy on the zinc smelters in their present plight. They made great profits in 1915-16, they knew (at any rate they were told) what was going to happen, and if some of them have had to throw away their plants the high prices represented precisely that contingency and the market offered the amortization in advance. However, this is cold comfort to many smelters who are permanently in business and are now disappointed and perplexed. Them we advise to forget the past and turn their eyes to the future. With the enormous smelting capacity that we now possess, with the competition of the electrolytic producers, and with so many of the galvanizers making their own spelter, the idea of other smelters ought to be to increase the consumption of spelter by developing new uses for it.

The one great field for increasing the use of spelter is in sheet zinc. It has been notorious during the last 20 years that while a very large part of the spelter of Europe has been rolled the United States has so treated only a small part of its product. Perhaps we cannot use so much sheet zinc for roofing in this country; perhaps our conditions may not be favorable to that; but certainly we can put zinc sheets and rods,

light and heavy, to many more uses than at present and now is the time, preëminently the time, to do it. For, with a surplus of plant and of smeltermen, reflected in the relatively low price of spelter, we are in a position to substitute sheet zinc for other sheet metals, especially tin plate and copper, that are in deficient supply.

It is well known that the Germans, who are short of copper and tin, have done this. We ought to do likewise and even more extensively, for we shall continue to make and use many things that the Germans have been compelled to dispense with. Let anybody observe the articles in everyday use that are made of sheet metal for which zinc might be substituted—covers of containers, cans, buttons, gas and electric fixtures, hardware trimmings, buckles, to mention but a few of the hundreds of things that will be noted by one who opens his eyes. Consider also the multitude of things for which cast zinc might be used as well as cast brass.

This is the way that zinc smelters ought to be thinking. It is interesting that the New Jersey Zinc Co., which is now building a rolling mill, is probably thinking this way. There ought to be more rolling mills, more competition in the sheet-zinc business, and the rollers should unite in a propaganda to increase the use of their product. Now is the time of all times, when copper and tin are in such scant supply as to be unobtainable for many former uses.

Status of Flotation Litigation

THE illuminating article by R. C. Canby in this issue on the status of the flotation-patent litigation of Minerals Separation in America will interest every mining and metallurgical engineer who is anxious to know the essential points in the decisions thus far rendered. The article will interest especially those engineers who, through not being directly affected, have stood without the maze of patent phraseology involved in this litigation, hoping the way would be cleared before they had occasion to make use of the flotation process. Mr. Canby has performed a distinct service to the mining industry in pointing out the high spots in this well-nigh interminable litigation, and in so clarifying the main points at issue that the ordinary operator may grasp the real scope of the Minerals Separation patents. The industry has long needed such a clarifying presentation of this subject.

The article, while of considerable length, will well repay careful reading and will be readily understood by those who have not heretofore attempted to follow the intricate phases of this litigation. In his lucid presentation of the subject the author has eliminated patent verbiage so far as is possible in treating of the patent claims of Minerals Separation. Mr. Canby, who was the developer of the Miami Copper Co.'s practice in flotation, naturally speaks from his side of the case. Minerals Separation will not be expected to accept his views so far as they may represent the expression of personal opinion, but the especial value of the article is in the general review of the American litigation and the directing of attention to certain pertinent paragraphs of the courts' decisions indicating the limitations of the Minerals Separation patents. It is made clear that the flotation process is by no means a monopoly.

BY THE WAY

Throw a couple of rocks in that chute, "pard," I think the boss is down on the sill listenin'.—*The Anode.*

The first experience in price-fixing of which there is any record, says a contemporary, was in the year 301, when Emperor Diocletian fixed maximum prices on over one thousand articles. It was so arbitrary a measure that it finally ended in much bloodshed. Out of fear, nothing was offered for sale, and the scarcity grew much worse; until, after the death of many persons, the law was repealed.

An Associated Press correspondent who has just returned from Russia sketches the composition of the Bolsheviki party as first composed of innumerable German paid agitators and propagandists, whose sole purpose is to reduce the country to complete anarchy. The second class is composed of fanatics, escaped criminals, released political prisoners, and expatriated Russians whom political amnesty brought back to the country. These the sense of accumulated wrongs, real and imaginary, of half a century has driven into a frenzy of anarchistic revolt, and without sharing the motives of their German leaders, they find their doctrines quite congenial. The third and largest class is a tremendous body of ignorant workmen and soldiers with nebulous notions of democracy, who have been taught by their leaders that freedom is a debauch of idleness. This briefly is the Bolsheviki, maximalist or extreme socialist faction in Russia.

We have already told about how Gelasio Caetani, now Captain Caetani, used the Brunton transit in surveying the mine with which he blew up the Col di Lana. Mr. Brunton recently received a letter from Captain Caetani that he has sent to us with permission to publish it, as follows:

War Zone, Italy, Oct. 19, 1917.

My Dear Brunton:

From the Italian Front I am writing to tell you that your Brunton compass has followed me through 14 years of American mining life, and now for over two years from trench to trench; from the Alps to Macedonia, and from there to the arid Carso. The great mine I made at Col di Lana was all surveyed with your compass, and the work turned out so true that it made the first success of its kind at the Italian Front.

At last, after 16 years' service, mark No. 1999 got knocked out by a shell, and I have replaced it with No. 7871, which contains remarkable improvements for trench work. It requires less risk in using it.

All this is to tell you how grateful I am to you and your little instrument—my ever-faithful companion—and the great help America is giving to our cause, for a little part is also given by your compass.

My kindest regards to my many friends in America and to yourself. Sincerely yours,

CAPT. G. CAETANI,
Royal Engineers.

David W. Brunton, Esq.,
Denver, Colo.

Mr. Brunton adds properly that Captain Caetani must have had a pretty narrow squeak when his instrument was smashed, but with characteristic modesty he says nothing about it.

November Mining Dividends

Dividends disbursed in November, 1917, by 27 United States mining and metallurgical companies making public reports amounted to $9,697,493, as compared with $12,245,275 paid by 29 companies in November, 1916. Canadian and Mexican companies paid $1,509,226, as compared with $1,941,798 in November, 1916.

The Coniagas Mines, Ltd., and Mass Consolidated Mining Co. passed their dividends and the Hecla Mining Co. reduced its rate from 15c. to 5c. per share. Miami, Shannon and United Verde omitted the "extras," which they have been recently adding to their regular payments.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead and Sm., pfd	U. S.	$1.50	$144,840
Anaconda, c	Mont.	2.00	4,662,500
Barnes King Dev., c	Mont.	.10	40,000
Big Creek Leasing	Ida.	.50	2,500
Caledonia, l. s.	Ida.	.03	78,150
Chief Cons., s. l.	Utah	.10	88,406
Cons. Arizona Smelting, c	Ariz.	.05	83,150
Cresson, g. s.	Colo.	.10	122,000
Golden Cycle, g.	Colo.	.03	45,000
Grand Central	Utah	.04	20,000
Granite, g.	Colo.	.01	16,500
Hecla, l. s.	Ida.	.05	50,000
Homestake, g.	S. D.	.65	163,254
Internatl. Nickel, pfd	U. S.-Can.	1.50	133,689
Iron Cap Copper, c	Ariz.	.50	72,055
Mammoth, g. s. l. c.	Utah	.10	40,000
Miami, c	Ariz.	1.50	1,120,671
Nevada Wonder, g. s.	Nev.	.10	140,840
New Jersey Zinc	U. S.	4.00	1,400,000
Prince Cons., l. s.	Nev.	.02½	25,000
Shannon, c	Ariz.	.25	75,000
Tamarack & Custer, l. s.	Ida.	.03	53,288
United Eastern, g	Ariz.	.05	68,150
United Verde, c	Ariz.	.75	225,000
United Verde Extension, c	Ariz.	.75	787,500
Wilbert, l. s.	Utah	.01	10,000
Yellow Pine, z. l.	Nev.	.03	30,000

Canadian and Mexican Companies	Situation	Per Share	Total
Amparo, g. s.	Mex.	$0.03	$60,000
Asbestos Corpn. of Can., pfd.	Que.	1.00	40,000
El Oro Min. & Ry. g.	Mex.	.24	57,375
Granby Cons., c	B. C.	2.50	374,963
Greene-Cananea, c	Mex.	2.00	976,888

The dividend by El Oro Mining and Railway Co., which was the first since 1913, was announced as a payment from past profits.

The totals for the first eleven months of the year are as follows: Mining and metallurgical companies, $188,898,860; holding companies, $4,979,361; Canadian, Central American, South American and Mexican mines, $17,891,083.

Utah Copper on Fifth Avenue

It is doubtful if many mine operators, engineers, geologists or metallurgists regard their particular success or accomplishments from an artistic point of view, unless professional pride may be said to partake of the artistic. Appreciation, however, of the possibilities of a field not frequently explored by the artist is disclosed in the recent exhibition in a Fifth Avenue art gallery of mine paintings, by Jonas Lie, presenting examples of American mining and metallurgy as developed by the Utah Copper Co., and a canvas depicting the Garfield converters. Daniel C. Jackling, the developer and one of the principal owners of Utah Copper, commissioned Mr. Lie to paint the Utah Copper series which are on exhibition at the galleries of M. Knoedler & Co. at 556 Fifth Ave., New York.

Concerning this exhibition, the *New York Herald* of Nov. 18, says:

It is understood that the commissioner of Mr. Lie's pictures recommended the method of operation that has caused this mine to yield such wealth of ore. The method had been to tunnel in. He divined that the property was a mountain of copper and had it dug away in a series of benches or terraces, starting from the top. As a result there are 75 steam shovels working day and night, with an average daily yield of 30,000 to 40,000 tons. Persons who have viewed the mountain in proper perspective say that the benches look like great steps and that, as the mountain narrows into a peak, there is a strong resemblance to a pyramid with columns of steam and smoke rising from the shovels at work. The resemblance has been recognized by Mr. Lie, one of whose canvases is entitled "The Pyramid."

Largest among the paintings are the "General View" and "From the Upper Tramway Station." These are 50 x 74 in. Then comes "The Pyramid," at the foot of which is an excavation resembling an amphitheater. No. 4 is "The Approach." The others are "Bingham," one of the mining towns; "The Pit," "Sunrise," a view of the mine soon after daybreak; a view from above and a more sketchy version of the upper tramway station. Mr. Lie shows everything about the mine, which lies about 20 miles from Salt Lake City, except the dump, that is beginning to rise, like another mountain, out of the lake.

A tenth picture is the Garfield converters in operation. It is entitled "The Garfield Converters," and was painted for E. A. Cappelen Smith, one of the inventors of this converter.

The A. S. & R. Co. vs. B. H. & S. M. & C. Co.

F. W. Bradley, president of the Bunker Hill & Sullivan Mining and Concentrating Co., has written a letter under date of Nov. 14 to a stockholder, in which he summarizes the points at issue between his company and the American Smelting and Refining Co. as follows:

Dear Sir:

I have your letter of 9th inst. with clipping from *Wall Street Journal* of 8th inst. regarding above litigation, which I have read and herewith return.

The suit referred to in the clipping was started last August in the effort to prevent us from smelting our own ore in our own smelter, which started up operations July 5th last. A petition was made for a temporary injunction pending the outcome of the litigation, which resulted in a preliminary hearing before United States Judge Woolverton in Portland, Ore., on 7th, 8th and 9th inst. Judge Woolverton now has the matter under consideration, and will render an opinion at his convenience. In the meanwhile, our smelter is in continuous operation.

The plaintiff, in effect, charges that it was the real purchaser of our interest in the Tacoma Smelter; that the purchase was made with the idea of securing all our ore for a period of 25 years, so that we would not again go into the smelting business for that length of time; and that the only reason we have gone into it again is because our cupidity was aroused by the recent war prices for lead.

On the other hand, we contend that plaintiff was not the real purchaser; that all our product was not covered by the 25-year contract; that we incurred no obligation not to again go into the smelting business; that "cupidity" had nothing to do with the building of our smelter, as we began the work before lead had reached the recent war prices; and that one of the reasons for the building of our own smelter was because the American Smelting and Refining Co. had so suppressed competition that we could find no market whatever for such of our production as was not covered by the 25-year contract.

Our legal defenses have been very briefiy summarized by Mr. M. A. Folsom, as follows:

"Our 25-year smelting contract was made in 1905 with the Tacoma Smelting Co. Until 1912 this company received part of our ore at its plant at Tacoma and diverted the balance to the smelters of the A. S. and R. Co. In 1912 the Tacoma Smelting Co. abandoned its lead plant and since that time all of our ores have been diverted to the A. S. and R. Co. We have not had a contract wtih the A. S. and R. Co.; but it seems that in June of this year, after we had completed our smelter, the A. S. and R. Co. procured an assignment of the Tacoma contract and is now seeking to enforce it in the name of the A. S. and R. Co. The Tacoma company, with whom the contract was made, has no plant now in which it could handle our ore, and of course will not be damaged if we smelt our own ores.

"We contend that the contract could not be assigned without our consent, because it imposed financial obligations upon the Tacoma company, and we had a right to say that

we would not look to any other company for the performance of those obligations. The Supreme Court of the United States seems to have held that a smelting contract like ours cannot be transferred by one smelting company to another.

"But in any event, our contract was amended in 1907 so that the Tacoma company agreed to pay us during the life of the contract for lead in our ore the price for lead made by the A. S. and R. Co. in New York City on the date of any shipment. In other words, the Tacoma company and our company agreed to let a third party (the A. S. and R. Co.) fix the price for the lead each day and we would settle accordingly. Now the price fixer claims to have taken an assignment of the contract and seeks the aid of the court to compel us to deliver lead ore to him during the next 12 years at the price which he shall himself fix!"

As to the other matters mentioned in the clipping from the *Wall Street Journal* of 8th inst., our ores have never averaged as high as 8 oz. of silver and 14% of lead as stated; but they have averaged approximately 4½ oz. of silver and 11% lead. The same article states that our dividends have been but $15,500,000; whereas the total has been $20,370,000, and in addition we have $6,500,000 of actual operating profits tied up as invested capital in the shape of cash, securities, plant and property. Also in addition, we have eight years' ore developed and ready for mining, concentrating and smelting.

However, it is true, as stated in the clipping, that we would have been better off if we had some time ago installed a smelting plant at the mine to take the place of our water concentrating plants; but the statement is not correct in throwing out the inference that we could have had a smelting plant at the mine from the beginning, not only because of lack of railroad facilities, but also because the progress in the art of smelting has but recently enabled us to establish an up-to-date plant at the mine that can compete with other established lead-smelting plants in the United States.

I am taking the liberty of sending copies of this letter to some of our stockholders who may have also seen the article you have so kindly called my attention to.

Yours very truly,

F. W. BRADLEY.

San Francisco, Calif., Nov. 14, 1917.

Mexico To Adjust Damage Claims

According to dispatches from Mexico City a damage claim bureau to adjust claims arising during the revolution will be established, as provided in a decree issued by President Carranza on Nov. 25. The president will also designate the rules of procedure.

All claims must be presented in Spanish with as many affidavits of proof as possible. Each claim must outline the amount of damages and the name and nationality of the person making it. Foreigners must attach to their claims certificates of nationality, or otherwise it will be assumed that they are Mexicans. Companies incorporated under the Mexican law will be considered Mexican concerns. When a foreigner shall be dissatisfied with an award he may present a personal claim through his diplomatic representative, which will be arbitrated by three persons—one designated by the president, one by the foreign diplomat, and one by mutual appointment. In no case may an arbitrator belong to the diplomatic or consular service. The term for the filing of claims will expire three years from the date of the signing of today's decree.

The question of returning to private control the National Railways of Mexico, which for some time have been operated by the Constitutional government, was taken up at a meeting of the directors of the company, on Nov. 23 in Mexico City. Carlos Dasave y del Castillo Megrente, chairman of the board of directors, and Luis Cabrera, Minister of Finance and a member of the board, will go shortly to New York to discuss arrangements for resumption of control by the company.

Back Up the Twenty-Seventh Engineers

The movement that was started last week to organize a Comfort Club for the 27th Engineers, the mining industry's own regiment, with the purpose of raising a fund out of which to buy such comforts as cigarettes, pipes and tobacco, is now well under way, and the suggestion that those who must stay should help to make life pleasant for those who go has already met a generous response. The *Journal's* original subscription of $1000 has been more than doubled. Donations received to date are:

Engineering and Mining Journal	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00

The generous subscription of the New York Engineering Co. was accompanied by a letter which we reproduce. Another donor suggests that the aid of the ladies' committee of the Institute and the Mining and Metallurgical Society be enlisted to help increase the fund, which is an excellent idea. The letters follow:

NEW YORK ENGINEERING COMPANY
U. S. Express Building
2 Rector Street
Office of the President
New York, U. S. A., Nov. 26, 1917.

Mr. W. R. Ingalls,
Engineering and Mining Journal,
New York, N. Y.

Dear Mr. Ingalls:

I am glad to note in your last issue that you have started the ball rolling for a subscription to the 27th Engineer Regiment, and I herewith enclose check for $1000.00 to help keep this ball in motion.

Mining work always has been hazardous, but with the additional casualties from shot and shell, certainly these men who volunteer deserve everything that we can give them.

Judging by the personnel of the officers of this regiment, we are sure that it will accomplish wonderful work, and we should all be proud of the opportunity to render any service to this splendid regiment.

If I can be of any further service, please command me, and wishing you all success, I beg to remain,

Yours very truly,
(Signed) A. C. LUDLUM.

New York, Nov. 23, 1917.

Mr. W. R. Ingalls,
Engineering and Mining Journal,
New York, N. Y.

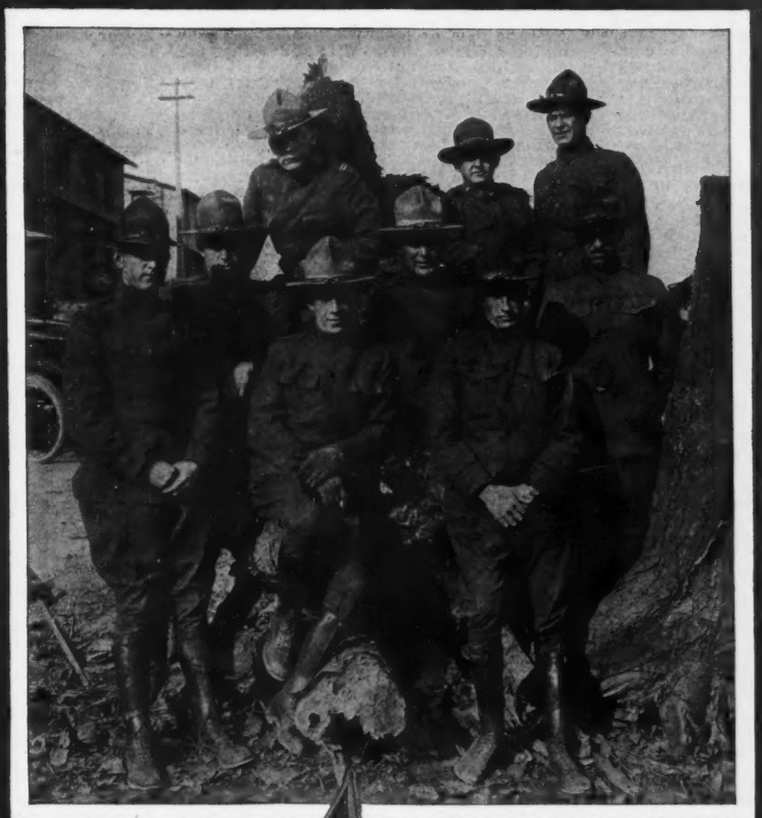
Dear Mr. Ingalls:

Notice of your recently organized Comfort Club for the 27th Engineer Regiment, appearing in your issue of November 24th, has been read by me and will be read by the mining profession throughout this country with much interest and sympathy. It will receive the support of the profession at large. I most heartily endorse this move on the part of the *Journal* and suggest that you invite the joint ladies' committee of the A.I.M.E. and the Mining and Metallurgical Society to use their organization to collect subscriptions for the Club. This ladies' committee, as you know, has organized subcommittees throughout the West for the purpose of collecting funds for relief and other purposes.

Very truly,
MINING ENGINEER.

Back up the men of this regiment who have enlisted for the most dangerous work at the front. Think of them whenever you settle down for a comfortable smoke and imagine how it would be if the rôles were reversed. You can impress them in a most intimate way that mining men have their self-sacrifice in mind, simply by joining the Comfort Club. Remember the 27th Engineers and keep on remembering them until you have mailed us your check, drawn to the order of the *Engineering and Mining Journal.*

COMPANY A, 27TH U.S. ENGINEERS



THE FIRST MILITARY MINING UNIT TO BE ORGANIZED IN THE UNITED STATES ARMY

This is the nucleus of the thousands of men who probably will be incorporated in the special mining regiments which are to form a portion of the American Expeditionary Army. Company A is at Camp Meade, Md. The upper photograph is of the officers of Company A. In the front row, left to right: Lieut. Ellsworth H. Shriver, Capt. Norval J. E. Welsh (commanding), First Lieut. Ralph S. Edmondson. Middle row, left to right: Lieut. Vaughn H. Wilson, First Lieut. Buckingham Miller, First Lieut. John J. Croston. Back row, left to right: Medical Corps: Capt. Wilson G. Wood, Lieutenants Brady and Gillespie

Personals

The offices and equipment of both the constituent units in the consolidated McGraw-Hill Publishing Co. are now under one roof. In the confusion incident to the removal of what was formerly the McGraw Publishing Co.'s plant from West 39th St. to the Hill Building, at 10th Ave. and 36th St., there may be some slight delay in receiving your copies of the "Engineering and Mining Journal." For this we ask your indulgence, with the assurance that after readjustments have been made the combined facilities of the two big plants will leave nothing to be desired in the way of prompt and efficient service.

Leighton Stewart, mining engineer, has established an office at 42 Broadway, New York.

R. S. Archibald has gone to South Dakota, to look over some prospects in the Black Hills.

Gordon R. Campbell, secretary of the Calumet & Arizona Mining Co., is visiting New York and other eastern points on business.

J. B. Moore has resigned as superintendent of mines for the Tigre Mining Co., at Esqueda, Sonora, Mexico, and will shortly return to San Antonio, Texas.

Benjamin B. Thayer has returned to New York from an inspection of the Anaconda properties in Montana, and of the International Smelting Co. at Tooele, Utah.

R. M. Edwards, president of the Franklin, South Lake, and other mining companies, who has been for several months at Houghton, Mich., has returned to Boston for the winter.

A. G. Mackenzie, secretary of the Utah chapter of the American Mining Congress, was in Washington recently investigating the possibility of Government action affecting lead and zinc.

Hon. Martin Burrell, Secretary of State and Minister of Mines, in the newly formed Unionist government of Canada, has been elected by acclamation for the constituency of Yale-Cariboo, B. C.

John B. Wise, superintendent of the electrolytic and acid plants of the Chile Exploration Co., Chuquicamata, Chile, returned to Chuquicamata on Oct. 18 and resumed his former duties.

Frank L. Estep, chief engineer of the Tennessee Coal, Iron and Railroad Co., has resigned to accept a similar position with the Nova Scotia Steel and Coal Co. at New Glasgow, Nova Scotia.

Dr. Allerton S. Cushman, president of the Institute of Industrial Research at Washington, is now a major in the Officers' Reserve Corps, and has been assigned special research work on the chemistry of high explosives, under the ordnance section.

E. A. Holbrook, formerly professor in the mining department of the University of Illinois, has been appointed supervising mining engineer and metallurgist with the U. S. Bureau of Mines, and will act as superintendent of the station at Urbana, Illinois.

W. B. Plank, formerly assistant engineer of the Pittsburgh station of the U. S. Bureau of Mines, has been appointed mining engineer in the mine-safety section, and will have headquarters at the station. Rescue car No. 3 at Evansville, Ind., will be under his charge.

J. Frater Taylor will retire from the presidency of the Algoma Steel Corporation at the end of the year, but will continue his connection with its affairs in an advisory capacity as chairman of the Lake Superior Corporation. **W. C. Franz** will succeed him as president.

George A. Millar, superintendent of the Bessemer Rolling Mills, at Bessemer, Ala., will leave to take charge of construction of the new steel mills at Fairfield, both properties belonging to the Tennessee Coal, Iron and Railroad Co. He will be succeeded by **W. J. Smith,** formerly assistant superintendent.

Obituary

James Hamilton Peabody, formerly Governor of Colorado, died in Denver, on Nov. 23, aged 65 years. He was elected Governor in 1902. Shortly after this, the strike of miners at Cripple Creek occurred. Early in November, 1903, he was required to call out the state militia to quiet disorders resulting from the Vindicator mine explosion in Cripple Creek, in which two men were killed. A few months later he caused the arrest of Charles H. Moyer, president of the Western Federation of Miners, who was later released by U. S. Judge Thayer at St. Louis. Peabody was defeated for reëlection but was declared the lawful governor of the state by the General Assembly in March, 1905. He surrendered the office to Lieut. Gov. Jesse F. McDonald by agreement, however, after serving only a few hours.

Grant B. Schley, controlling owner of the Britannia Mining and Smelting Co., of British Columbia, died at his home at Far Hills, N. J., on Nov. 22, aged 72 years, after a long period of ill health. He was born in Chapinsville, N. Y., in 1845, and came to New York in 1870. In 1885 he became a partner in the newly formed brokerage firm of Moore & Schley. He was prominent during the panic of 1907 through the purchase and subsequent absorption of the Tennessee Coal, Iron and Railroad Co. by the Steel Corporation. He was one of those summoned to Washington to appear before the Senate Committee on the Judiciary, which investigated the affairs of the Tennessee company. It was through the efforts of Mr. Schley that the Britannia Mining and Smelting Co. was made a profitable producer. This company, incorporated in British Columbia in 1908 to take over the Britannia mine and assets of the Britannia Copper Syndicate, as well as property of the Britannia Smelting Co. Ltd., was a failure at first. After most of his associates in the enterprise gave up hope, Mr. Schley advanced the money for the further development that turned the mine into a profitable producer. Mr. Schley was a director of the American Smelting and Refining Co., the Chihuahua Mining Co., the Coal Creek Mining and Manufacturing Co., the Pittsburgh Coal Co., the Republic Iron and Steel Co., and several others. He was a member of many clubs, including the Union League, Metropolitan and New York Yacht Clubs.

Sir Leander Starr Jameson, leader of the famous Jameson Raid in the Transvaal, South Africa, died on Nov. 26 in London, aged 65 years. He was born in Edinburgh, Scotland, in 1853 and received the degree of M.D. from London in 1877. He went to South Africa soon after the discovery of the Kimberley mines, where he became a friend of Cecil Rhodes. From 1891 to 1895, Jameson acted as administrator of Mashonaland and for services rendered was appointed to the same office in Rhodesia. Dr. Jameson promised the Uitlanders to redress their grievances against the Boers. On Dec. 29, 1895, he invaded the Transvaal with 494 men, eight Maxims, and three light field pieces. He was surrounded at Doornkop, near Krugersdorp, and on Jan. 2, 1896, compelled to surrender. The Boers handed the raiders over to the British Government, and Jameson and the officers in command were tried in London. Jameson was found guilty of a felonious offence, and was sentenced to penal servitude, but the sentence was at once commuted to 10 months' ordinary imprisonment. He was released in December following, owing to ill-health. He later returned to South Africa and was elected Member for Kimberley in 1900. He was soon appointed a director of the De Beers company and of the British South Africa Co., of which latter company he was later president. When Rhodes' death occurred, Jameson was made Premier of Cape Colony, and Privy Councillor in 1907, resigning in 1908. From 1910 to 1912 he was Member of Parliament from the Harbor Division of Cape Town, and in 1911 was created baronet.

Societies

American Chemical Society, Philadelphia Section—Prof. Abraham Henwood, presiding officer of the section, has named the following committee to select candidates for the 1918 officers to be voted on at the December meeting of the section: Dr. H. S. Lukens, Clarence A. Hall and James K. Coyne.

Engineers' Society of Western Pennsylvania—A meeting of the Metallurgical and Mining Section was announced for Tuesday, Nov. 27, in the auditorium of the Union Arcade Bldg., Pittsburgh, Penn. J. E. Johnson, Jr., was to make an address on "The Situation Regarding Manganese, Pyrite, Sulphur, Chromium and Potash."

Engineers' Club of Northern Minnesota held its regular monthly meeting at Hibbing, on Nov. 17, at which the following officers were elected for the ensuing year: A. E. Anderson, Virginia, president; W. R. Van Slyke, Eveleth, vice president; E. E. Anderson, Chisholm, secretary-treasurer. Directors elected were: A. St. Vincent, Hibbing; A. Tancig, Chisholm, and Charles M. Dorway, Eveleth.

American Society of Mechanical Engineers will hold its thirty-eighth annual meeting in New York, on Dec. 4 to 7, in the Engineering Societies Bldg. At the opening session, honorary membership will be conferred upon Maj.-Gen. George W. Goethals, followed by an address by Hon. William H. Taft. The program will include the presentation of many papers. The dominant theme of the meeting will be the "Engineer's Part in War."

Mining and Metallurgical Society of America, New York Section, held a meeting on Nov. 22, at the Columbia University Club. Addresses were delivered on the following subjects: "Mining and Trench Construction on the French Front, with a Brief Description of Methods and Tools Used," by Major Rousseau, of the French Army Engineers, who is stationed in Washington as one of the French advisors of the United States Government; "27th Engineers' Regiment, (Mining) and the Work That It Is Expected to Perform Abroad," by Maj. O. B. Perry.

Trade Catalogs

Sullivan Angle-Compound Power-Driven Air Compressors. Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill. Bulletin 75C. Pp, 32; 6 x 9 in.; illustrated

Sullivan Tandem Compound-Corliss Air Compressors, Class WC. Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill. Bulletin 75F. Pp. 32; 6 x 9 in.; illustrated.

"Better Ventilation—Lower Production Costs" is the title of a new pamphlet issued by Bemis Bros. Bag Co., St. Louis, Mo., which treats of the ventilating problem in metal mines and the advantages of the Flexoid system.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Air Compressor. Henry Bolthoff, Denver, Colo. (U. S. No. 1,246,801; Nov. 13, 1917.)

Alloys—Process of Making Metallic Alloys. Hilliary Eldridge, New York, N. Y. (U. S. No. 1,246,571; Nov. 13, 1917.)

Briquettes—Process of Making Briquettes or Other Molded Articles. Carleton Ellis, Montclair, N. J., assignor to Ellis-Foster Co. (U. S. No. 1,246,805; Nov. 13, 1917.)

Cadmium in Zinc Ores—Apparatus for Removing Cadmium from Zinc Ores. Charles Pomeroy Fiske, Palmerton, Penn., assignor to the New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,246,576; Nov. 13, 1917.)

Caisson. James C. Meem, Brooklyn, N. Y., assignor of one-half to Frederick L. Cranford, Brooklyn, N. Y. (U. S. No. 1,246,136; Nov. 13, 1917.)

Carbide Lamp. George Bowie, Herrin, Ill. (U. S. No. 1,246,534; Nov. 13, 1917.)

Centrifugal Pumping Apparatus. Gustav Pagel, Charlottenburg, Germany, assignor to General Electric Co. (U. S. No. 1,246,-149; Nov. 13, 1917.)

Dumping Cages, Shoe for. George Heeren, Gillespie, Ill. (U. S. No. 1,246,596; Nov. 13, 1917.)

Excavation — Apparatus for Sheathing the Walls of an Excavation. James C. Meem, Brooklyn, N. Y., assignor of one-half to Frederick L. Cranford, Brooklyn, N. Y. (U. S. No. 1,246,133; Nov. 13, 1917.)

Ingot Mold. Emil Gathmann, Baltimore, Md. (U. S. No. 1,246,738; Nov. 13, 1917.)

Metal-Tempering Compound. Axel S. Carlson, Denver, Colo. (U. S. No. 1,246,-802; Nov. 13, 1917.)

Ore-Concentration Process. Walter A. Scott, Chicago, Ill. (U. S. No. 1,246,665; Nov. 13, 1917.)

Ore-Treating Apparatus. Herbert B. Walling, Salt Lake City, Utah, assignor to Western Mining and Exploration Co. (U. S. No. 1,246,195; Nov. 13, 1917.)

Trench Machine, Multiple Wheel. Frederic E. Bager, Kenosha, Wis., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,246,524; Nov. 13, 1917.)

Trenching Machine. Hans J. Bentson, La Lolla, Calif., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,246,527; Nov. 13, 1917.)

Tube and Ball Mill—Combined Tube Mill and Ball Mill. Leo L. Mushett, Manhattan, Nev. (U. S. No. 1,246,775; Nov. 13, 1917.)

Tunnel Shield. James C. Meem, Brooklyn, N. Y., assignor of one-half to Frederick L. Cranford, Brooklyn, N. Y. (U. S. No. 1,246,134; Nov. 13, 1917.)

Editorial Correspondence

SAN FRANCISCO—Nov. 24

California Oil Fields Statistics for month of October show a production of 8,417,597 bbl. and shipments of 9,455,295 bbl. This represents a reduction of 1,037,698 bbl. in the total of stocks during the month leaving the amount of stocks on hand at Nov. 1, 33,762,500 bbl. This represents also a decrease from Jan. 1, 1917, of 9,877,794 bbl. from the stocks on hand at that date. During October the daily average production was 271,535 bbl. and daily average shipments were 305,010 bbl. compared to 278,156 bbl. daily average production in September and 297,074 bbl. daily average shipments in September. These figures are from the report of the Independent Oil Producers' Agency and are practically comparable to the figures issued by the Standard Oil Company.

Miners' Frontier Carnival at Randsburg is suggested by the "Golden State Miner." That paper calls attention to the fact that Bakersfield has its County Fair, Pasadena, a Rose Festival, San Bernardino, an Annual Orange Day, and Los Angeles, its Rodeo. So Randsburg wants to make a showing of frontier mining life. It is well situated for such a carnival, as it combines the mountains and the desert within a radius of a few miles. It has also the attraction of being the center of a territory which produces gold, silver, lead, zinc, copper, tungsten, potash and salt. Randsburg, Johannesburg and Atolia are the three important towns of what is commonly termed the Randsburg district. Randsburg is noted as the home of the Yellow Aster mine. Johannesburg is the terminus of the Santa Fe branch railroad, which runs out from Kramer. Atolia is one of the oldest tungsten camps in this country and still is a large producer. The three camps could make a fine showing in the way of a carnival of frontier mining incidents. It is to be hoped that, if this carnival should be held, the morale of the carnival will be cleaner than has been exhibited in other places as representative of the days of '49. If Randsburg should follow the lead of Atolia and declare itself dry, the three camps, Randsburg, Johannesburg and Atolia, could make a fine showing. A few years ago a dry mining camp was thought to be an impossibility, but the sentiments of the people and the demand for sobriety, honesty and moral conduct has made wonderful changes in the mining camps of the West, and it is probable that within a few years the use of intoxicating liquors will be barred out of all mining camps.

Kern River Oil Fields have not been irreparably damaged by the infiltration of water. The petroleum department of the State Mining Bureau has demonstrated that repairs to wells when intelligently directed are both profitable to the owners and increase the amount of marketable oil. A rumor which has gained some headway is that oil wells in the Kern and other fields have been so badly damaged by water as to greatly shorten the life of the fields, and the State Mineralogist Hamilton and R. P. McLaughlin, oil and gas supervisor, have recently made examinations and kept a record which proves the beneficial results of proper repairs to infiltrated wells. A recent tabulated statement showing conditions before and after repairs of 11 wells in Kern County shows that two of these wells produced no oil and that one flowed 12,000 bbl. of water and the other 1440 bbl. Two wells showed only a trace of oil. One well produced 3 bbl. oil and 32 bbl. of water; two wells produced each 5 bbl. of oil and a total of 650 bbl. of water; one well produced 5 bbl. of oil and 5 bbl. of water, and one, 7 bbl. of oil and 1000 bbl. of water. This is a total of 25 bbl. of oil and 15,927 bbl. of water from 11 wells. After repairs it is shown that nine of these wells produced a total of 59 bbl. of oil and 240 bbl. of water; one well had a trace of oil and 100 bbl. of water. Another produced 10 bbl. of oil and only a trace of water. Mr. McLaughlin states that it would not have been necessary to install a single compressor plant in the entire Kern River field, had operators availed themselves of the services of competent geologists to direct early developments. He states also that compressors can now be dispensed with by the adoption of proper technical methods. The direction and inspection of new development work throughout the state as required by law, prevents the engineering staff of the bureau from solving all the old problems that may be presented; but geologists and engineers have a right and are welcome to the use of general plans developed by the bureau. It is shown by the record of the Alma, Jr., Oil Co., well No. 2, repaired under the immediate supervision of the mining bureau staff, that the repair work cost approximately $10,000, required about five months' time, resulted in the elimination of two compressor plants which were employed formerly in lifting 15,000 bbl. of water daily. This means a saving of nearly 100 bbl. of fuel oil daily and reducing operating expenses $500 per month. The saving amounts to about $115 a day, and the production of oil has been slightly increased, making a total daily saving of about $150 daily or a profit of 500% on the expenditure for repairs.

BUTTE—Nov. 23

Coal Situation in Montana is becoming more serious as the consumer faces either an actual shortage or prohibitive prices in spite of all the efforts of the Federal and state authorities to check the continuous rise in retail prices. On Nov. 16 the general public was startled by an alarm sent out by State Fuel Administrator Swindlehurst and published in the daily papers over his signature, that Montana is facing a coal shortage this winter, and that it therefore behooved every consumer to save coal. It was also explained that the threatened shortage was not due to operations at the mines but to the inability of the railroads to furnish sufficient cars to haul the coal, and that the administration was therefore more or less helpless to afford relief. Railroad officials explain the car shortage by the fact that all available cars are pressed into service for handling ammunitions and food for the Allies and that every 24 hours, some 500 cars are sent east by the Western railroads while only 300 are returned, meaning a loss of 200 cars a day to these roads. Under such conditions, if true, the supply of cars will ultimately cease altogether with results that may mean considerable suffering to the inhabitants of this part of the country. In the meantime the general public is being fed on promises of investigations and price regulations; meetings of local committees are being held all over the state; several Government agents have arrived to study the situation, but nothing tangible has as yet resulted from all these efforts in the way of relief to the general public which has practically given up hope that such relief will ever come. While the present abnormal conditions are taken into account by all intelligent citizens, yet the suspicion is growing in Montana as elsewhere that the control of production and sale of coal and other articles of daily use is either not in the hands of those most competent to handle such important business or that Government control is impossible of achievement on account of inherent difficulties and in spite of the best intentions of those entrusted with the task.

SALT LAKE CITY—Nov. 24

Clearing House for Coal Producers in this section is being established to work in harmony with the fuel administration to help in the solution of the problem of distribution. The Utah Producers' organization—embracing all the producing companies of the state—asked to appoint representatives in the clearing house, has named John S. Critchlow, of the United States Fuel Co., and William Gordon, of the Independent Coal and Coke Co. A third man will be chosen from outside the state. Reports of coal shipments made the week ended Nov. 17, show: For the Denver & Rio Grande, 1298 cars shipped, as compared to 1481 the week preceding; the Oregon Short Line shipped 719, as compared with 675 the week preceding, and the Union Pacific 545, as compared with 544. Beginning Dec. 1, the Utah Coal Route will relieve the congestion of the mines at Hiawatha, Black Hawk, Mohrland, Panther, etc., which at present have their only outlet over the Denver & Rio Grande; and this new factor in the transportation question will soon make itself felt. Up to the present, shipment has been made in carload lots by the various railroads, and it is now proposed to ship directly to the retailers. The coal mines of the state are in a position to meet the demand, but the danger of shortage still exists, owing to the difficulties confronting the railroads in regard to equipment, motive power, labor shortage, etc. However, the coming into operation at this time of a new coal-carrying line should do much to better the situation.

WALLACE, IDAHO—Nov. 24

Bunker Hill Affected by Suit of Star Mining Co. vs. Federal Mining and Smelting Co. was a fact frankly made known by the testimony of Stanly A. Easton, who appeared in the case on behalf of the Star company. Mr. Easton's testimony was in line with that of other experts engaged by the plaintiff company to the effect that the apex of the lode in controversy is within the boundaries of the Evening Star claim. In response to a question on cross examination as to whether or not the Bunker Hill & Sullivan company was interested in the outcome of the trial, Mr. Easton unhesitatingly stated that it was. In explanation he stated that the Federal Mining and Smelting Co., the defendant, was a subsidiary of the American Smelting and Refining Co., which was endeavoring to control the lead output of the Cœur d'Alene district; that if the Federal company gained possession of the ore in dispute, it would, of course, be diverted to the smelteries of the A. S. & R. Co., which would be a long step in furtherance of its designs; and in confirmation of this he referred to the case now pending in the Federal court in which the A. S. & R. Co. is endeavoring to enforce a construction of its contract with the Bunker Hill & Sullivan company through which the Bunker Hill would be barred from treating its ore in its own smeltery and be forced to ship it to the A. S. & R. The impression is that the interest of the Bunker Hill & Sullivan goes beyond the desire to have the ore in controversy open for competitive bidding, as indicated in Mr. Easton's statement. The Star company, while strong financially, has practically retired from mining operations. A few months ago the Federal company had an option on the property and did much work toward developing it through the Morning workings, but allowed the option to lapse. The contention of the Federal in the recent trial suggests that the company abandoned the Star option when it became convinced that the main ore shoot apexed on its own ground and not on the Star. It is now believed that in the event that the court decides the Star-Federal case in favor of the Star, the Bunker Hill & Sullivan company will take over the Star mine and place it on a productive basis, thus turning a large tonnage to its own smeltery which might otherwise go to competitors.

ELY, NEV.—Nov. 24

Production of Lead Ore in the eastern section of White Pine County will soon show a decrease. The first snow has appeared, which causes the outside mines to try to get their ore to the railroad, resulting in a general shortage of cars for transportation. Also considerable dissatisfaction has occurred on account of the present price of lead, producers claiming they cannot make operations pay, and a curtailment in production will result. The smelter embargoes have had a bad effect. The Ward mine, at the request of the smelters, has cut its shipments to not exceeding 50 tons daily. The Hunter mine, which a few months ago had half a dozen different leasers working producing silver-lead ore, is closed down, probably for the winter. The Muncy and Aurum Coper properties, which have been shipping considerable ore, will be obliged to close soon on account of transportation conditions, the snow preventing haulage over the range.

HOUGHTON, MICH.—Nov. 24

Copper Range Co.'s Suit against Adams township for $56,000 paid in taxes on the Baltic mine, under protest in 1915 was decided in favor of the defendant by Judge Patrick H. O'Brien, of the Houghton County Circuit Court. The decision sustains the method used by the county equalization committee and state tax commission in the use of stock quotations as a valuation basis. This is a method that has been in general use in Michigan for many years. A decision in favor of the company bringing the suit would have undoubtedly had a

far-reaching effect as it would bear upon every copper-producing property and prospect in the state. The other question involved in the suit, regarding the undervaluation of properties in Calumet and Osceola townships, was answered in the decision by finding that the 1915 assessment cannot be attacked on ground of frauds. In connection with the stock quotation valuation method, Judge O'Brien said that the Baltic and other Copper Range mines are comparatively young properties and the stock-market investor, with an uncanny foresight of the market, places a higher market value in proportion to the earning power for that reason. He believes, therefore, and holds that this method of valuing a property for taxation is not fundamentally wrong. An interesting fact brought out in the suit was that the copper mines of Michigan pay a larger percentage of their net earnings for taxes than the mines of any other district in the world.

JOPLIN, MO.—Nov. 24

Extension of Field north and west of Picher to near Chetopa, Kan., is indicated by recent findings of the Hoover Mining and Royalty Co., of that place. Drilling has shown good ore formations and shaft sinking has been started and will be followed immediately by the construction of a concentrating plant.

Record Time in Development and mill building has just been made by the William Kenefick interests, of Kansas City, in starting their new mill west of Baxter, Kan., known as the Blue Diamond. Shaft sinking was started Sept. 9; two shafts have been put down to 220 ft. connected with a 240-ft. air drift, and there is room for eight machine drills. Mill building was started Sept. 14, and a 250-ton modern plant has been constructed. On Nov. 26 the property will start operations double shift.

Zinc Ore Market is Poorer than even the nominal market prices for ore indicate, is the conclusion of the officials of the Ore Producers' Association, who, during the last few days, have made an extended investigation. During the last three weeks, the condition of the market has been aggravated by a shortage of cars for shipments. At a number of the mines in the Oklahoma fields there have been no bids on ore for three weeks and they will have to shut down or enlarge their bins.

Revival at Spring City, Mo., of mining operations are expected to follow the ending of litigation between the St. Paul Mining Co. and the Delta Lead and Zinc Co. By the terms of the adjustment, the St. Paul Co., which owns the land in fee, takes over the lease and the 150-ton Aladdin mill, also equipment at shafts Nos. 5, 7 and 8, the pumping plant at the Alpha shaft, and also the Delta lease on the McGowan land. In preparation for the renewal of active operations, the St. Paul Co. has started a 2500-gal. Layne centrifugal pump to drain the land.

ST. LOUIS, MO.—Nov. 24

Wage Cut of 75c. per Day has been made by the lead mining companies throughout the Southeast Missouri lead district, this cut to take effect on Dec. 1. The Catherine mine, near Fredericktown, Mo., which is under lease by the Federal Lead Co., has been closed.

TORONTO—Nov. 24

Opening of Rice Lake gold mining district of Manitoba is to be aided by the Provincial government, which will construct a winter road from Fort Alexander at a cost of $10,000. This will enable the mine owners to bring in the machinery for several small mills and greatly hasten development work.

Flotation in Use in Gold Mill in Ontario for the first time when the Miller Independence mine, of Boston Creek, adopted the process for its 35-ton mill. The system of treatment is by Blake rock crusher delivering into 4 x 5-ft. ball mill, and a Groch flotation machine. The company is treating ore averaging $8 per ton, and the recovery has averaged close to 94% of the gold content. About 30% of the gold is recovered on the amalgamating plates, 30% in the mercury traps and the rest in the flotation concentrates, which assay $200 to the ton.

LITTLE BAY, N. F.—Nov. 20

Copper Mining in New Foundland has been generally dull during the last four decades, the only mining activity being shown in the iron industry of the Nova Scotia Steel and Dominion Steel companies, at Wabana. The population and wealth of the country are interested mostly in industries connected with the sea. There are many well-known commercial deposits of minerals favorably located on the seacoast, but until outside parties become interested they must remain dormant. The copper deposits of the island are mainly in the Bay of Notre Dame, where there are 5000 sq.mi. of serpentine formation and many outcrops of high-grade chalcopyrite. The only operations of any size now being worked are Tilt Cove and Little Bay, the former shipping from 15 to 20 thousand tons annually of hand-picked ore. These operations have been producing almost continually since 1864, about 250 persons being employed and all mining is done above tide, there being no boiler or pump in operation. Drilling is done with hand steel. Little Bay mine, 20 miles west of Tilt Cove, was discovered in 1878, when 10,000 tons of 8% copper were stoped from the outcrop and it continued working until 1894, when the price of metal dropped so low the operators quit. During the years of shipping, there were produced 215,000 tons of 10% copper ore, about 4000 tons of matte of 32% copper and 6000 tons of "best selected" metal smelted on the property. In all, about one million tons were mined, the existing dumps containing upward of 500,000 tons, not including slags. The drainage from these dumps runs into a pond 1200 x 800 ft., where there are ideal conditions for cementation. The mine is situated about 1500 ft. from tidewater, where a shipping pier is under construction and a tunnel from it is completed 600 ft. This tunnel will tap the old workings at the 250-ft. level. The mine is 1452 ft. deep and the total length of the workings is but 1000 ft. Pumping is underway with the object of working the tunnel from both ends and ascertaining the extent of the orebody exposed by crosscuts in the foot wall, many of which were driven in searching for a parallel rich occurrence, which was never found, although as far as prospecting went, low-grade ore (3-4%) was found. Thirty-two miles west of this property—14 miles from tidewater—there is a chalcopyrite outcrop, owned by local capital, which was recently incorporated as the Great Gull Lake Copper Co. Three shafts are being sunk to a depth of 60 ft., the outcrop being traced for several miles and shows pay ore with boulders on the surface from one to 150 tons, assaying 7% copper. All these ores carry small amounts of gold and silver. One other enterprise is an attempt to open a deposit of molybdenum in White Bay. While almost every known ore occurs in the country, there is not a concentrator in operation on the island.

The Mining News

ALABAMA

Jefferson County

SUPERIOR IRON AND LAND CO. (Birmingham)—Incorporated with capital of $50,000. Officers are L. K. Steiner, president, R. F. Huffman, vice president, and Carl Steiner, secretary and treasurer.

NATIONAL STEEL PRODUCTS CO. (Bessemer)—Recently organized with capital of $50,000 to manufacture railroad appliances, patented and steel castings. Expect to be in operation in 90 days. R. S. Bohanan, president; Geo. A. Millar, vice president; J. V. Calvin, secretary.

Lauderdale County

FLORENCE ROLLING MILL (Florence)—Idle for several years, will be opened under management of John Armistead, of Birmingham, to manufacture iron and steel hoops and steel spikes. Gas from Sheffield furnace will be used for fuel. Martin J. Lide, of Birmingham, consulting engineer.

ARIZONA

Cochise County

GRAND CENTRAL (Fairbank) — Tailings dump of Grand Central mine east of here purchased by J. H. Hunt & Co., and machinery being erected to treat it.

COPPER QUEEN (Bisbee) — Water to operate new concentration plant to be obtained from Cochise shaft. New plant will handle large tonnage of low-grade ore developed in granite porphyry of Sacramento Hill.

Gila County

LOUIS D'OR (Globe)—Second drill hole to be started soon. Small leaching plant on Cedar Tree claim operating under lease.

OLD DOMINION (Globe)—Offers bonus of a $50 Liberty Bond to employees who remain with company continuously for one year. After paying for bond in installments, employee receives at end of year his bond and money paid and interest.

Mohave County

CUPEL (Kingman)—High-grade silver-lead ore opened in Springer shaft. Was formerly a large producer.

WHITE HILLS (Chloride)—Lessees taking out high-grade silver ores. Property situated 30 miles from here.

GOLD ORE (Goldroad)—Control secured by E. H. Teter & Co., owners of Big Jim. Shaft will be sunk additional 200 ft. with considerable drifting. Over 30,000 tons of ore already developed.

Pinal County

BROKEN HILL (Ray)—Wagon road to mine nearly completed.

SWASTIKA (Tucson)—Property in San Xavier district sold recently for $125,000.

YELLOW GROUP (Twin Buttes)—Ross and Tovote, of Tucson, operating under lease.

RIGGINS (Kelvin) — Molybdenum property sold to Robert Boykin, of Tucson, shipping to refinery at Tucson.

QUEEN CREEK (Superior) — Sinking continues below 450-ft. level. Messrs. Mackay and Stevens of Dundee, Scotland, accompanied by W. E. Defty, consulting engineer, recently visited property.

Santa Cruz County

DUQUESNE (Patagonia) — Shipping about 200 tons daily. Steam plant replaced by electricity.

Yavapai County

JEROME DISTRICT will continue operation of mines under labor agreement prepared by Judge E. W. Lewis, of the President's commission. The agreement embodies the same general points contained in the agreements effected in other Arizona mining districts.

DUNDEE ARIZONA (Jerome) — New electrical equipment received; sinking resumed.

CALUMET & JEROME (Jerome) — Air hoist installed at collar of winze on 600-ft. level about 100 ft. south of shaft. Crosscut No. 1 advanced 480 ft. from 600-ft. station. In two months work on 600-ft. level amounted to more than 1500 feet.

Yuma County

COBRITA VERDE (Salome)—Work to be resumed under direction of C. H. Reedall. Shaft will be sunk to 500 feet.

MOHICAN (Yuma)—Groundstone group of gold claims near Alamo have been taken over by controlling interests in the Mohican.

ARKANSAS

Baxter County

ANSEL-CRAWFORD (Mountain Home)—Installing new engine in small mill.

BIG JOHN (Mountain Home)—Leased to B. S. Ansel, who has started development. Will drive tunnel on zinc outcrop.

Marion County

ZINC BASIN (Rush)—Leased by Oklahoma-Arkansas Mining Co. Will start operations at once. Luther Evans, formerly with J. C. Shepherd, in charge.

TEMPLE MINING CO. (Buffalo)—Shipping first car hand-cobbed zinc carbonate ore this week. Last six months development opened up good working face. Will start erection of small concentrating plant at once.

PHILADELPHIA (Rush)—One of J. C. Shepherd group. Will install electric motor to handle cars. Main tunnel 1800 ft. in mountain with ore showing; recovery is

15%. Cross vein of blende cut at 1500 ft. still continues; three well defined leads of carbonate. Mill running steadily two shifts.

CALIFORNIA

Calaveras County

OLD CALAVERAS (Sheepranch)—Optioned by E. J. Bumsted and associates, of Los Angeles; installed 20-hp. electric hoist to develop property, if sampling results warrant. Opened in 1866 and produced $500,000 in 20-stamp mill.

FEDERAL GOLD MINING CO. (Carson Hill)—Permitted to issue 100,000 shares common stock and 5000 shares preferred stock to W. A. Copps, for Allison group of claims in Carson Hill district; also to sell 100,000 shares preferred stock at 25c., proceeds to be used for installation of 50-ton mill for development work.

Inyo County

CALIFORNIA ALKALI CO. (Olancha)—Production of chemicals for United States Government necessitates employment of armed guards. Situated at Cartago, at southern end of Owens Lake.

Kern County

BLACKHAWK (Randsburg) — High-grade ore disclosed in lower levels in 14-in. vein. Operated by Yellow Aster Mining and Milling Co.

Mendocino County

NATURAL GAS flow reported in town of Willits. Geological conditions do not indicate existence of large field, but results stated to be encouraging.

Nevada County

ALLISON RANCH (Grass Valley)—Water lowered to 800-ft. level and will develop immediately.

GOLDEN CENTER (Grass Valley)—Mining resumed. Milling ore from 600- and 700-ft. levels. Pumps lifting about 400 gal. of water per minute.

OSTROM & CO. (Nevada City)—Tapped gravel below bedrock at Hunts Mill claim by 600-ft. tunnel. Good pay found; channel will be further developed; washing will be started when winter rains begin.

Placer County

POVERTY BAR DREDGE (Auburn)—This dredge, working in Poverty Bar district, on middle fork American River, northeast of Auburn, which was overturned last August, has been righted; pumping out and repairing damage. Owned and operated by El Dorado & Placer Gold Dredging Co. In operation about five years.

Sacramento County

NATOMAS CO. (Natoma)—W. H. Comstock sold to company, land at rear of his property adjoining town of Folsom and old Natomas ranch. No. 10 dredge, operating nearby, will continue on acquired land.

San Bernardino County

RAINSTORM (Randsburg)—This property, the Union and No. 1, are all working; new hoist installed on Ackley lease.

BLACKHAWK (Randsburg)—Work on this tungsten mine resumed; new machinery installed; drifting will begin on 300-ft. level; crosscut will be started on the 500-ft. level.

RED DOG MILL (Johannesburg)—Reported mill will be remodeled for treatment of tungsten ores, under lease to G. W. Dennis. Operated for years on custom gold ores in Randsburg district.

Shasta County

BITUMINOUS COAL reported disclosed in 8-ft. and 5-ft. veins on Beegum Creek, in Harrison Gulch district. Location notices posted and filed on 36 acres covering prospective coal beds. Situated about 54 miles southwest from Redding on Tehama County line.

Sierra County

TABLE ROCK MINING CO. (Howland Flat)—Permitted to issue additional 100,000 shares capital stock.

Siskiyou County

CARTER (Sawyers Bar)—Waike & Mathis purchased interest of G. D. Carter. Situated five miles below the bar. Mine equipped for greater capacity.

TAYLOR LAKE (Etna Mills)—Being prospected and sampled by A. McCartney and associates prior to developing. Property owned by Harris Bros.

GRAY EAGLE COPPER (Happy Camp)—William Korner, manager, reported to have said company will continue development for next six months to determine construction of railroad westward to coast or eastward to Southern Pacific. Underground mining done under contract; employing 50 men.

Storey County

UNION (Virginia City)—Milled 380 tons on Mexican mill, averaging $23.50. On 2400-ft. level extracted ore sampling $29 and $32 per ton.

MEXICAN (Virginia City) — Repairs made; west crosscut started north of winze from 2500-ft. depth on 2900-ft. level and extended seven feet to total of 103 ft.; face in porphyry and stringers of quartz. Mill treated 341 tons Ophir ore, sampling $10.42, and 380 tons Union ore, sampling $23.50.

Tuolumne County

STAR KING MINES (Tuolumne)—Permitted to issue 90,000 shares to Ronald C. Kennedy in exchange for Star King and Sherman patented claims and the American claim, together with equipment and water rights on north fork of Tuolumne River, two miles southeast of Tuolumne. Is also permitted to sell 40,000 shares at $1, proceeds to be used for further development.

Ventura County

STATE CONSOLIDATED OIL CO. (Ventura)—Ordered by state supervisor to complete repairs to save this well and others from infiltration by water. Flowed initially 100 bbl. per day, but lack of casing allowed water to wash out derrick foundation and caused collapse of rig.

Yuba County

GOLDEN ARROW (Rackerby)—Known as Old Spanish, credited with poduction of $300,000, being reopened by W. T. Baldwin and associates. In early days ore worked in arrastra. Present operators moving 5-stamp mill from Butterfly mine.

COLORADO

Clear Creek County

OCTOBER SHIPMENTS to Idaho Springs sampling plant were 1220 tons, averaging $25 per ton.

TERRIBLE - DUNDERBERG (Georgetown)—Unwatering; Terrible shaft unwatered to point between 1300- and 1400-ft. levels. Will resume operations when workings unwatered on 1400-ft. level.

MOUNTAIN MINING AND MILLING CO. (Idaho Springs)—This Seaton Mt. property leased by Denver men; workings being retimbered and repaired. Electrically driven air compressor installed. Main adit is Idaho tunnel, cutting Bride vein at 1200 ft. from portal.

Gilpin County

GOLD LODE (Central City)—Shaft and levels retimbered. Good-grade gold-copper-lead ore being stoped on 200-ft. level.

HAMPTON (Central City) — Work resumed; shaft will be sunk 100 ft. deeper. Ore carrying enargite opened on 300-ft. level.

CASHIER MINING CO. (Central City)—New mill building now enclosed and foundations for machinery being laid. Meeker shaft being retimbered; developing.

Lake County

OHIO TUNNEL (Leadville)—Contracted for driving tunnel 1000 ft. at Birdseye property.

WOLFTONE (Leadville) — Shipping about 200 tons of zinc carbonate ore daily. Property operated by Western Mining Co.

MAY QUEEN (Leadville)—Large body of zinc carbonate ore opened by this leasing company, operating through Hayden shaft on Yankee Hill.

P. O. S. (Leadville)—Lessees repairing surface plant and installing machinery. Shaft will be retimbered before mining manganese ore left when mine was worked years ago.

Ouray County

REVENUE (Ouray)—Lessees operating. Shipping good-grade lead-silver ore.

ATLAS (Ouray)—Mine and milling plant operating steadily. Good recovery made by flotation.

BARSTOW (Ouray) — Lessees shipping fluorspar from cross vein, requiring hand-sorting to bring it up to grade.

San Juan County

EMPIRE STATE (Silverton)—Incorporated recently with capitalization of $300,000; will operate property in Eureka section.

SUNNYSIDE (Eureka)—Construction of new milling plant, and tramway from lower adit level, being pushed. Mill expected to have capacity of 500 tons daily at start, and may be increased to 750 tons later. Old mill, with capacity of 500 tons daily, will be supplied by old tramway from upper workings for the present; eventually a central crushing plant will be built at portal of lower adit, just above upper new tram terminal.

San Miguel County

FAVORITE (Ophir) — Lessees mining shipping-grade ore.

LEWIS MINING AND LEASING CO. (Telluride)—Installing flotation machines to secure better recovery.

NEW DOMINION (Ophir) — Shipping smelting ore; milling-grade ore developed; may build mill if unable to make other arrangements.

ELECTRIC OVENS for baking being installed by some of large mines of Telluride district. Considered more economical than coal at high altitudes.

Summit County

UNION (Breckenridge)—Shaft house and machinery overhauled. Work will begin soon; 100-ton mill at portal of main tunnel.

FARNCOMBE HILL DREDGING CO. (Breckenridge)—Weather conditions favorable for late work by dredges this autumn.

BAKER (Breckenridge) — Milling-grade lead ore opened by lessees. Will probably arrange for treatment at old Union mill.

OURAY-PUZZLE (Breckenridge)—Lessees working through both Ouray and Puzzle adits. Ouray shaft will be repaired, and development work on deeper levels done.

Teller County

EL PASO EXTENSION (Cripple Creek)—Drifting on phonolite dike from Campbell tunnel.

ORPHA MAY (Cripple Creek)—Lessees shipping ore from this property of Stratton's Mining and Development Co.

KOMAT LEASING CO. (Cripple Creek)—Shipping milling-grade ore. Developing on 800-ft. level in ore-shoot.

IDAHO

Shoshone County

RAY-JEFFERSON (Wallace) — Long crosscut being run to open vein 1000 ft. below lowest workings and 1800 ft. from surface; 1000 ft. remains to be run, which means probably four months before mill will have Ray-Jefferson ore.

MIDNIGHT (Mullan)—Bonded to New York syndicate. Vein cut by No. 5 tunnel of the Morning. Drifts east and west opened 300 ft. of good ore. Raise being made to tunnel, 360 ft. above; now up 150 ft. in ore. Compressor driven by electric power installed at portal of upper tunnel; boarding and bunk houses built. Extending tunnel to point over raise, which will be carried to surface.

AMAZON-MANHATTAN (Wallace)—Recently in litigation between Interstate-Callahan and Patrick Burke and property awarded to latter. Burke was backed by Day interests, and now preparing for operation. Aërial tramway nearly completed to convey ore to Ray-Jefferson mill, about half mile away; necessary buildings erected at mine. While in possession of Interstate-Callahan, considerable ore developed and connection made with lower workings of Interstate-Callahan. The Days control the Ray-Jefferson, which explains treatment of Amazon-Manhattan ore at that mill.

MICHIGAN

Copper

AHMEEK (Ahmeek)—Shipping 4400 tons daily; yield above 22 lb. a ton.

OSCEOLA (Osceola) — Has sunk shaft further after cutting plat at 38th level of No. 1 North Kearsarge.

LA SALLE (Calumet)—During last five weeks advanced 110 ft. in good ground on 45th level from Old Osceola.

ISLE ROYALE (Houghton)—Will ship this month 70,000 tons. Opening 1700 ft. of new ground monthly.

QUINCY (Hancock)—Shipping 4000 tons daily; sinking at No. 2 shaft just reached 78th level and the 67th at No. 8.

NEW BALTIC (Houghton)—Has so far 325 ft. of proved rich ground, counting the unopened stretch lying in center, on 2nd level.

COPPER RANGE (Painesdale) — Has just sold old Atlantic mill at Redridge to Lake Superior Iron and Metal Co. as "old iron."

HOUGHTON (Houghton) — Began Nov. 21 in west vein to drift on 350-ft. unopened stretch, and soon after it arrives at own ground will crosscut to examine West vein as well as Superior lode.

VICTORIA (Victoria)—Just about equalling expenses on 23½c. copper. Held back greatly by shortage of labor. Enlarged boarding house to accommodate 100. Mill improvements can be completed at any time.

BEAR LAKE "POOL" (Calumet) — Found in third hole another length of copper ground from 138 ft. to 166 ft., the last 20 ft. of which is good; stopped 315 ft. down and started fourth hole, 500 ft. west of third.

FRANKLIN (Demmon) — Pumped out bottom of No. 2 shaft, and begun to sink from 17th level to 18th. Waiting for electric motor for experimental plant, consisting of Hardinge mill and Wilfley tables for obtaining better recovery.

MINNESOTA

Mesabi Range

NEW PORT MINING CO. (Grand Rapids)—Two properties being developed south of Pokegama Lake near here. Two shafts being sunk, five drills working and boiler house and camps under construction.

CHIPPEWA IRON CO. (Ely)—Situated on McDonald property adjoining Section "30" mine. Boarding house, blacksmith shop, dry and engine house completed. Shaft now 30 ft. deep. H. D. Mullen, superintendent.

OLIVER (Coleraine) — Large washing plant on Trout Lake closed down for season. Shipped about 2,500,000 tons of concentrates which means plant received and washed over 5,000,000 tons of ore. Mines still shipping merchantable ore to docks.

M. A. HANNA CO. (Chisholm)—Two drills of Carlson Exploration Co. check drilling on S½, NW¼, Sec. 27-58-20, just southeast of this village. Also sinking on southeast corner, 5 x 7-ft. test shaft. If results are satisfactory, large openpit will be stripped with outlet through the Dunwoody mine; owned in fee by Pine Land Co. and leased by M. A. Hanna Co.

MISSOURI

Joplin District

MINE OPERATORS' CLUB has completed construction of temporary quarters at Picher, Okla. First meeting will be held on Dec. 3.

OLD RELIABLE (Quapaw, Okla.)—Purchased Algonquin mill, situated at Stotts City, Mo., and will move to site just east of Quapaw, where shaft is down to ore at 70 feet.

HIGH FIVE (Waco)—Putting down 19-in. drill hole to 230 ft. for installation of 1000-gal. Pomona pump, in order that shafts may be put down dry. Two shafts already down to water.

PLAYTER BROS. (Joplin)—Have sunk two shafts to 190 ft. on lease west of Blue Mound, Kan., and drifting at this level. Ore run goes to 250 ft. but heavy water caused owners to stop at 190-ft. level for present, awaiting pumping by other companies to help drain the water later.

DESSIE LEE (Wentworth)—Has new 250-ton mill almost ready for operation, adjoining Georgette. Drilling indicates same formation on Dessie Lee tract as on Georgette, and both companies owned by same men. O. B. Henry, of Wentworth, principal owner and manager.

MONTANA

Lewis and Clark County

SCRATCH GRAVEL GOLD (Helena)—Drifting and stoping on 500-ft. level.

COFFEE-BYRNES (Helena)—Shipping 100 tons to smeltery.

ALLARD-REED (Helena)—Shipping two carloads silver-manganese iron ore.

HELENA (Helena)—Shipped 22 carloads to smeltery. Three carloads in bins.

ECONOMY (Helena)—Drifting on strong vein at 200-ft. level.

STEMWINDER (Helena)—Stoping ore for shipment to smeltery.

ROCK ROSE (Helena)—Two carloads weekly to smeltery.

PEERLESS JENNIE (Rimini) — Mine, four miles south, after being closed for 29 years, is being reopened by Chicago men. Consists of 10 claims, belonging to Beattie estate, on which new operators have secured long-time lease and bond.

Madison County

BIRDIE MINES at Red Bluff reported under lease and bond. New operators expected to install flotation process at once to treat ore from mine and old dumps on adjoining properties. Boaz mine in same district being reopened by syndicate of Butte men who have lease and bond.

Silver Bow County

ANACONDA (Butte) — Tramway mine resumed operations on morning of Nov. 19, after shutdown of nearly two months, during which time shaft has been fireproofed by half-inch coating of cement, using cement gun. Shaft and station timbers also coated. Cost is reported as $21.50 per lin.ft. of shaft. On Nov. 16 company hoisted a total of 13,772 tons of ore and employed 9280 men at its Butte mines, being about 88% of normal force.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Nov. 17, amounted to 10,093 tons, valued at $176,628, comparing with 9901 tons the previous week. Producers were: Tonopah Belmont, 2440 tons; Tonopah Mining, 2600 tons; Tonopah Extension, 2380 tons; Jim Butler, 850 tons; West End, 1003 tons; MacNamara, 500 tons; Halifax, 55 tons; Montana, 144 tons; Cash Boy, 100 tons.

White Pine County

NEVADA CONSOLIDATED (McGill)—Mining about 14,000 tons daily; coal supply constantly short, using own cars and employees to bring supply from Utah and Wyoming mines. Installation of new coal-crushing and storage plant, costing $400,000, will be completed this year; will likely continue using fuel oil at cost of $1 more per barrel upon expiration of contract, Jan. 1, 1918, because coal cannot be obtained.

CONSOLIDATED COPPERMINES CO. (Kimberly)—Running one section of mill constantly, one section being shut down for repairs most of time. Owing to insufficient development of Morris workings, obtaining some ore from Ora claim, being mined by Nevada Consolidated under contract. It is stated that recovery is 80% in milling. Have laid off 25% of labor engaged in construction and outside work, owing to cold weather; churn drilling stopped; development in Alpha workings promising. Cutting wood from outlying claims for fuel. Recently let several leases on 15% net royalty; former 25% gross royalty basis proved unsuccessful.

OREGON

Jackson County

MANGANESE METAL CO., of Tacoma, Wash., purchased manganese properties in Lake Creek district, north of Medford. Has been prospecting for several months, securing options and preparing for development.

Josephine County

OSGOOD (Waldo)—I. L. Thompson, of Seattle, made second payment on this placer mine, one mile south of here. Preparing for development work. Bedrock shows some platinum.

DEL NORTE CLAIMHOLDERS ASSOCIATION (Waldo)—Commenced construction of eight-mile road from Waldo to copper claims in Preston Peak district. Supplies received. J. T. Gilmore and A. C. Hoffman, in charge.

UTAH

Salt Lake County

ALTA CONSOLIDATED (Alta)—Shipping grade ore opened at 600 ft. Winze being sunk in ore.

CARDIFF (Salt Lake)—Shipping average of 75 tons of ore daily to bins at South Fork, awaiting better ore market.

UTAH COPPER (Bingham)—Expected alterations to plants will permit handling up to 50,000 tons a day during the coming year, as compared to the high record of 38,000 tons daily at present.

COLUMBUS-REXALL (Alta) — New tram line working; from Nov. 1 to Nov. 7 good tonnage carried, consisting of shipping ore, mill ore and waste. Sent to smelteries about 200 tons of ore the week ended Nov. 7, and more in transit. Character of ore assures market.

OHIO COPPER (Bingham)—Expected to have first 600-ton unit of 2000-ton flotation plant in operation shortly after Jan. 1 and mill completed by March if no delay in receipt of electrical equipment. Cost stated from $400,000 to $500,000; company free from debt. Albert Frank, general manager, resigned to act in advisory capacity.

MICHIGAN-UTAH (Alta)—Tram line to Tanner's Flat being repaired. Shipped 350 tons, week ended Nov. 10, ore coming from several parts of property; three cars from strike in Lavinia fissure, Copper Prince tunnel, shipped on company account; four cars from Solitude or Big Cottonwood side, Pioneer Leasing shipping and six cars from old City Rocks section, Triangle Leasing Co. shipping.

Summit County

PARK CITY SHIPMENTS, week ended Nov. 10, were 2574 tons, as compared with 2500 tons week preceding.

WASHINGTON

Pend Oreille County

STERLING SILVER (Metaline Falls)—Increasing capacity of mill to 50 tons per day.

BELLA MAY AND DIAMOND R (Metaline Falls)—Being worked under lease and bond by Campbell & De Camp. Expect to employ 15 men through winter.

METALINE ORIOLE MINING CO. (Metaline Falls)—Will erect 50-ton mill if funds are available. Shipped carload lead ore last week in October. F. N. Davis, president.

CANADA

Ontario

ORE SHIPMENTS from Cobalt for October over Temiskaming & Northern Ontario Ry., as reported by Arthur A. Cole, mining engineer, were: Alladin-Cobalt, 71 tons; Beaver, 43; Buffalo, 208; Coniagas, 83; Dominion Reduction, 255; Hudson Bay, 33; Kerr Lake, 60; La Rose, 149; Mining Corporation of Canada, 1437; McKinley-Darragh, 268; National, 59; Nippissing, 371; O'Brien, 65; Penn Canadian, 31; Temiskaming, 32; Trethewey, 27; total, 3191 tons from Cobalt proper; Miller Lake-O'Brien (Elk Lake), 38 tons; Alexo mine (Porquis Junction), 611 tons.

PATRICIA (Boston Creek)—Shaft down 50 ft. on good ore.

JANSEN CLAIM (Bourkes Station)—Being opened up.

UNITED KIRKLAND (Kirkland Lake)—Shaft down 65 ft. with encouraging results.

PROVINCIAL (Cobalt)—Report on this property shows ore reserves containing 110,500 ounces.

LAKE SHORE (Kirkland Lake)—New mill expected to be completed early next year, with capacity of about 100 tons a day.

NIPISSING (Cobalt) — In October produced silver to value of $306,107 from Nipissing and customs ore, a decrease of $43,000 from the preceding month.

MINING CORPORATION (Cobalt) — Producing 4,500,000 oz. silver a year. Has recently taken option on new gold discovery in Rickard township, and on old Waldman mine in Cobalt.

NEWRAY (Porcupine) — Shareholders ratified increase of capital to $3,000,000 and optioning of stock to Crown Reserve and Dominion Reduction Co., which are now operating property.

HOLLINGER (Porcupine)—Now ready to try out new milling equipment. Plant has capacity of 2800 tons a day, but probable that mine not ready to produce this amount continuously. About a mile of development work a month being done.

M. J. O'BRIEN, LIMITED, is name of new $20,000,000 company formed to take over all holdings of M. J. O'Brien. Included in these are the O'Brien mine in Cobalt and Miller Lake-O'Brien property in Gowganda.

TEMISKAMING (Cobalt) — New report for stockholders by D. A. Mutch is not encouraging and shows a little less than previous reports. With exception of small tonnage of broken ore, there are no reserves and possibilities for further development not encouraging.

TECK HUGHES (Kirkland Lake) — At meeting to be held in Toronto a new plan of financing will be submitted to enable company to carry on development. Fiscal statement for the year ended Aug. 31, showed receipts of $31,896 and expenditures of $137,352. Mill idle for one year.

PHILIPPINE ISLANDS

NATIONAL COAL CO. (Manila)—This company, which was organized six months ago, and is exploring some coal deposits on the Island of Mindanao, has been granted a special charter by the Philippine Legislature. The capital stock is to be 3,000,000 pesos and the government is authorized to subscribe and pay for 51% of the shares, and is to be represented in the board. The first directors are Vincente Madrigal, C. H. French, Dalmacia Costas, Milton E. Springer and Rafael Corpus.

COSTA RICA

COSTA RICA MANGANESE AND MINING CO. (Playareal)—Shipped week ended Oct. 27, large steamer loaded with 51% manganese and immediately started loading another. A. M. Yonge, manager.

COLOMBIA

PARIS TRANSVAAL GOLD MINES, LTD. (Eastcheap, London, Eng.)—Acquired from Consolidated Colombia Platinum and Gold Mines, Limited: 50% interest in alluvial platinum and gold dredging and hydraulicking property of 10 square miles, known as Opogodó; four square miles known as Bolivar & Colonia, on River Guapi; option on mining rights of 12 additional properties, aggregating 36 square miles. The Opogodó property, according to report, has 1364 acres proved ground. The report also recommends the Bolivar & Colonia property be further prospected and also all other properties under option. A dredge of 60,000 cu.yd. monthly capacity is recommended to be installed on the Opogodó property. The cubic yardage and contents of tested areas on this property are reported as: Soledad, 3,781,000 cu.yd., averaging 23.2d. (46.4c.); Opogodó dredging area, 400,000 cu.yd. averaging 16.3d. (32.6c.); hydraulicking area, 60,000,000 cu.yd. averaging 6d. (12c.).

NEW ZEALAND

QUICKSILVER DEPOSITS believed to exist, especially in the Waihi district, have been so far undeveloped. To encourage their opening and exploitation the New Zealand government has offered a bonus of 8c. per lb. for the first 100,000 lb. of retorted quicksilver produced; the conditions being that 50,000 lb. must be produced before Mar. 31, 1920, and 50,000 lb. more before Mar. 31, 1921.

The Market Report

SILVER-AND-STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
22	4.7515	84⅛	42 11/16	26	4.7515	84⅛	42⅛
23	4.7515	84⅛	42 11/16	27	4.7515	84⅛	42⅛
24	4.7515	84⅛	42 11/16	28	4.7515	84⅛	42⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
22	*23½	†80	@6½	6.25 @6.35	7.70 @7.80
23	*23½	†80	@6½	6.25 @6.35	7.70 @7.80
24	*23½	†80	@6½	6.25 @6.35	7.70 @7.80
26	*23½	†80	@6½	6.25 @6.35	7.65 @7.75
27	*23½	†80	@6½	6.25 @6.35	7.65 @7.75
28	*23½	†80	@6½	6.25 @6.35	7.55 @7.65

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c. St. Louis-Pittsburgh, 13.1 cents.

LONDON

Nov.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
22	110	110	125	282½	281½	30½	54
23	110	110	125	282¼	281¼	30½	54
24							
26	110	110	125	283	281⅝	30½	54
27	110	110	125	284	282⅛	30½	54
28	110	110	125	286	284¼	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 28

All of the markets were dull this week, and but few features of interest are to be reported.

Copper—November is closing with an increased refinery production as compared with October, but a figure that is far short of the maximum in 1916. The Allies have been calling for a good deal of copper, and after the American Government takes what it needs, the supply for domestic consumption is still short, and there is prospect that it will so continue for months to come.

Arrangements were made this week by the Copper Producers Committee, with the sanction of the War Industries Board, for the supply of copper to jobbers for distribution to consumers who buy small quantities. Jobbers have been licensed at the several important centers of consumption, care being taken to select reliable concerns that are to be counted upon to conform to the stipulated conditions. They must buy in not less than carload lots, paying the standard price of 23½c., cash New York, subject to the usual freight allowances. In distributing to the retail trade in less than carload lots they are permitted to charge an advance of 5% on the price of 23½c. On that margin they have to carry the copper that they buy and meet the expenses of distribution.

Copper wire drawers are not giving out any quotations. This reflects the different positions in which they find themselves. Some of them inform us that they are not getting any copper at 23½c., but are taking in copper at higher figures under old contracts and naturally are unable to offer wire at 23½c. plus 4c., say. When the old contracts have run out the wire business will naturally steady itself.

Copper Sheets are quoted at 33c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled.

Tin—This market is quoted nominally at 80c. There were no sales, but anybody who had any tin to offer could get 80c. On Monday morning everybody received notices that the Government had attached all supplies of tin in warehouses. It is making analyses of the several parcels and the understanding is that everything assaying over 99.75% tin will be commandeered, while tin below that grade will be released.

Lead—This market was dull, transactions being smaller than in the previous week. However, there was a firm tone throughout and there were two noteworthy features; one being sales of a considerable tonnage for export to Europe, and the other being some buying by domestic consumers for delivery rather far ahead, January-February and January-March. Today there were inquiries in the market by domestic consumers for some round lots. In our reference to the size of the market this week we do not include some fairly large governmental transactions.

Zinc—This market was dull and weaker. The only interesting feature was some export business. At the close spelter was offered at 7.55c., St. Louis.

Sales of zinc dust were reported at 13½c. f.o.b. smelteries in the Middle West.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull with small transactions taking place at 37@38c. per lb. for No. 1 ingots at New York.

Antimony—The market continues small, but is a little firmer. We quote spot at 14@14½c., and futures at 13½c. c.i.f. in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—This market advanced to $105 late on Wednesday last. On Monday it advanced to $110. This probably reflects reduction of stock in this market for San Francisco has not advanced in the same proportion. Our telegraphic report from there is $103, firm.

Gold, Silver and Platinum

Silver—This market has been dull and steady in London during the last week, opening at 42 1/16d. and closing at 42⅜d. The New York market has been quiet with small offerings. Producers are awaiting news as to the proposed plan of the British and United States governments to buy one hundred million ounces at a fixed price around 85c. Conferences are now being held in Washington to try and arrive at some basis satisfactory to all interests.

Mexican dollars at New York: Nov. 22, 64⅜c.; 23, 64⅜c.; 24, 64⅜c.; 26, 64⅛c.; 27, 64⅛c.; 28, 64⅛c.

Coined silver in the United States Nov. 1 was: Standard dollars, $568,269,513; subsidiary coins, $209,864,845; total, $678,134,358. Of the standard dollars, $476,449,771 are held in the Treasury against silver certificates outstanding. The continuous fall in silver price, which is now about 25c. below the September maximum, is attributed to smaller coinage purchases, the break in speculation, larger supplies called out by the high prices, and sales from China.

Platinum—Active at $103@105.

Palladium—We quote $125, demand continuing active.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 24—Blende, per ton, high $72.95; basis 60% Zn, premium $73.50; medium to low, $65@55; calamine, per ton 40% Zn, $35@38; average selling price, all grades of zinc, $58.26 per ton.

Lead, high $75.80; basis 80% Pb, $75; average selling price, all grades of lead, $74.86 per ton.

Shipments the week: Blende, 6827, calamine, 372, lead, 1159 tons. Value, all ores the week, $506,230.

Producers returned from a consultation in New York bring no hopes of a betterment of the zinc situation, but are buoyed with hopes for lead, and are declining to accept the current offering of $75 base price.

Report reached here today that the Bartlesville Zinc Co. had withdrawn from use 65% of their retorts at Collinsville, Okla.

Platteville, Wis., Nov. 24—Blende, basis 60% Zn, $62 base for premium grade down to $57 base for second grade. Lead ore, basis 80% Pb, $65 per ton. Shipments reported for the week are 3703 tons of zinc ore, 190 tons of lead ore, and 591 tons of sulphur ore. For the year to date the figures are: 131,729 tons of zinc ore, 6587 tons of lead ore, and 25,740 tons of sulphur ore. Shipped during the week to separating plants, 4551 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit.

Molybdenum Ore—Unchanged at $2.20 per lb. of molybdenum sulphide, basis 90%.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

It is understood that shipment and allotments of pyrites will now be handled exclusively through the War Trade Board and that various committees which have had these matters in hand, will cease their activities in this direction.

Tungsten Ore—Considerable transactions are reported at no change in price, which ranges from $26 per unit for wolframite of the very highest grade down to $20 or less for lower grades of ore.

Iron Trade Review

NEW YORK—Nov. 28

The week has seen an increasing demand for steel products both from the Government and from manufacturing consumers, says "Iron Age." Many of the latter are buying for requirements not directly growing out of the war. Steel absorbed by the Government and by war contracts is a growing factor and is made to seem still larger as output is cut down by coal and coke shortage.

While priority decisions are limiting the amount of steel going to some consumers, there is as yet no shutting down of plants,

even in non-essential lines though such steps may not be far off.

That the Russian debacle will release locomotive capacity for domestic orders is of no little significance to railroads and shippers. Domestic car orders also may be more of a factor. The Union Pacific has just placed 3500 all-steel cars with four builders.

Lake Superior iron ore prices for 1918 are being discussed. In the first Government price fixing in September, ore was not changed, being really low if $33 was fair for pig iron. Indications now are that the 1917 ore basis will carry over into 1918, unless there should be a slight advance to cover possible increases in labor and transportation. Some reservations of special grades of ore have been made already for the coming season. In the effort to insure full supply, water shipments will be kept up into December, until the freeze-up comes.

PITTSBURGH—Nov. 27

There has been a slight improvement in shipping orders received by the mills against regular commercial contracts, the totals for November promising to make a very favorable comparison with those for October. There is also an increase in Government orders. Allotments of shell-steel tonnage are heavy and within a short time the mills will be producing much more shell steel than in 1916, when they were working on such large orders for the Entente. Prospects are for a rapid increase in the amount of ship plates to be called for, as the shipbuilding program is being speeded up by the adoption of still more fully standardized methods of construction. Predictions are more common that steel will be scarcer during the next few months than it is now, although these predictions are based partly upon fears that production will be curtailed throughout the winter. For two or three weeks production of pig iron has been at a smaller rate than the average of the last few months, on account of greater shortage of coke, and steel production has been correspondingly affected. There is also curtailment on account of shortage of coal. The Youngstown district has averaged a curtailment of about 25% in the production and finishing of steel in the last fortnight, while in the immediate Pittsburgh district the curtailment is in the neighborhood of 10%. Nearly all the large steel companies, normally self contained as to pig iron, would buy if they could, but there is practically no pig iron offered, the merchant furnaces having their output curtailed correspondingly. The Carnegie Steel Co. is now operating only 48 of its 59 blast furnaces.

In bars, shapes and plates mills are endeavoring to meet requirements of regular customers and are succeeding fairly well, although with difficulty. There is scarcely a mill that is not absolutely opposed to offering any steel, irrespective of circumstances, at above the prices set by agreement. There are one or two slackers whose attitude is thus made very conspicuous. In sheets and wire products the offerings are fairly free, at the set prices, as the mills in these lines had been running out of orders. In tubular goods the scarcity is still pronounced.

Pig Iron—There have been no transactions of any moment in bessemer or basic iron in the last week. It is estimated that 200,000 tons of these grades could be sold in a few hours, for delivery over the next four months, as nearly all the large steel interests are short of iron. In foundry iron the scarcity is not so pronounced, not because of heavy production but because a number of foundries are consuming less iron. Occasional small lot sales are being made for early delivery. The majority of foundry-iron furnaces will sell for all or any part of next year, not merely at the Government price, but with a stipulation that upon change in the Government price the contract would automatically be revised as to any unshipped iron, and this despite the fact that a Government change, if made, now seems likely to be downward rather than upward. We quote the market at the set prices: Bessemer, $36.30; basic and No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. valley furnaces, or 95c. higher delivered Pittsburgh.

Steel—Transactions in billets and sheet bars in the open market are infrequent and involve only small tonnages. Consumers with no regular source of supply, are inquiring for large tonnages, with little results. Consumers with regular mill connections are being well taken care of at the set prices: Billets, $47.50; small billets, $51; sheet bars, $51; slabs, $50, f.o.b. mill, Pittsburgh or Youngstown.

Ferroalloys

Ferromanganese—The market continues quiet, with $250 the common quotation for prompt or forward, but with frequent shading $1 to $3 in the price.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 27
Alaska Gold M.	2⅛
Alaska Juneau	2⅝
Am.Sm.& Ref.,com.	78
Am. Sm. & Ref., pf.	102
Am. Sm. Sec., pf., A	93½
Am. Sm. Sec., pf. B	‡96
Am. Zinc	14
Am. Zinc, pf.	42½
Anaconda	58⅛
Batopilas Min.	1
Bethlehem Steel	81½
Bethlehem Steel, pf.	87
Butte & Superior	17½
Cerro de Pasco	30
Chile Cop.	15⅝
Chino	42½
Colo.Fuel & Iron	36
Crucible Steel	55½
Dome Mines	6¼
Federal M. & S.	12
Federal M. & S., pf.	33½
Great Nor., ore ctf.	27½
Greene Cananea	38
Gulf States Steel	88
Homestake	95
Inspiration Con.	44½
International Nickel	27¾
Kennecott	33½
Lackawanna Steel	81⅛
Miami Copper	28⅛
Nat'l Lead, com.	44
National Lead, pf.	99½
Nev. Consol.	17½
Ontario Min.	4½
Quicksilver	.50
Quicksilver, pf.	.50
Ray Con	22⅜
Republic I.&S.,com.	78⅛
Republic I. & S., pf.	95⅛
Sloss-Sheffield	38⅛
Tennessee C. & C.	12⅜
U. S. Steel, com.	97⅛
U. S. Steel, pf.	109½
Utah Copper	78½
Va. Iron C. & C.	50

N. Y. CURB†	Nov. 27
Big Ledge	1½
Butte & N. Y.	1⅛
Butte C. & Z.	7
Butte Detroit	.25
Caledonia	.46
Calumet & Jerome	1 1/16
Can. Cop. Corpn	2
Carlisle	‡3½
Cashboy	.04½
Con. Ariz. Sm.	1⅛
Con. Coppermines	8½
Con. Nev.-Utah	‡ 1/16
Emma Con.	.50
First Nat. Cop.	2
Goldfield Con.	.43
Goldfield Merger	‡.04
Greenmonster	1/16
Hecla Min.	4⅛
Howe Sound	‡3⅛
Jerome Verde	⅛
Kerr Lake	5.12
Louisiana	.50
Magma	45½
Majestic	.34
McKinley-Dar-Sa.	.58
Milford	‡1⅛
Mohican	‡ 1/16
Mother Lode	.30
N. Y. & Hond.	‡12
Nipissing Mines	8⅛
Nixon Nevada	1 1/16
Ohio Cop.	‡1
Ray Hercules	‡3⅛
Richmond	‡.56
Rochester Mines	.39
St. Joseph Lead	16⅛
Standard S. L.	1/16
Stewart	1/16
Success	.13
Tonopah	‡⅛
Tonopah Ex	1⅛
Tribullion	‡⅛
Troy Arizona	.17
United Cop.	‡.50
United Verde Ext.	.32
United Zinc	1⅛
Utica Mines	.12
Yukon Gold	1⅛

SAN FRAN.*	Nov. 27
Alta	.03
Andes	.10
Best & Belcher	.03
Bullion	.01
Caledonia	.10
Challenge Con.	.05
Confidence	.01
Con. Virginia	.01
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.08
Mexican	.13
Occidental	.60
Ophir	.10
Overman	.04
Savage	.03
Sierra Nevada	.04
Union Con.	1.20
Utah Con.	.01
Belmont	3.50
Jim Butler	.77
MacNamara	.18
Midway	.07
Mont.-Tonopah	.08
North Star	.05
Rescue Eula	.09
West End Con.	.63
Atlanta	.09
Booth	.04
Comb. Frac.	‡.03
D'field Daisy	‡.02
Florence	.12
Jumbo Extension	.16
Kewanas	.06
Nevada Hills	.05
Nevada Packard	.20
Round Mountain	.20
Silver Pick	.08
White Caps	.80
Big Jim	‡.75
United Eastern	3.60

BOSTON EXCH.*	Nov. 27
Adventure	1
Ahmeek	82
Algomah	.25
Allouez	51½
Ariz. Com., ctfs.	11
Arnold	‡.25
Bonanza	.21
Butte-Balaklava	.52
Calumet & Ariz.	66
Calumet & Hecla	430
Centennial	14
Copper Range	45½
Daly West	2
Davis-Daly	4⅜
East Butte	10½
Franklin	4⅛
Granby	67
Hancock	9
Hedley	15½
Helvetia	.25
Indiana	1
Isle Royale	23½
Keweenaw	1⅛
Lake	6½
La Salle	2⅜
Mason Valley	5
Mass	6⅛
Mayflower	1⅛
Michigan	1¼
Mohawk	61
New Arcadian	1⅞
New Idria	12
North Butte	13½
North Lake	.50
Ojibway	1½
Old Dominion	39½
Osceola	60
Quincy	66⅞
St. Mary's M. L.	55
Santa Fe	.78
Seneca	26
Shannon	5⅞
Shattuck-Ariz.	19
So. Lake	1⅛
So. Utah	.15
Superior	5
Superior & Bost.	3½
Trinity	4
Tuolumne	1⅛
U. S. Smelting	45⅛
U. S. Smelt'g, pf.	45⅛
Utah Apex	2
Utah Con.	12⅞
Utah Metal	3
Victoria	2¼
Winona	1
Wolverine	33
Wyandot	.50

BOSTON CURB*	Nov. 27
Alaska Mines Corp.	.12
Bingham Mines	9⅛
Boston Ely	.50
Boston & Mont.	.50
Butte & Lon'n Dev.	.15
Calaveras	1⅛
Calumet-Corbin	‡.01
Chief Con.	1⅞
Cortez	.10
Crown Reserve	.20
Crystal Cop.	.58
Eagle & Blue Bell	2
Gila Copper	17⅛
Houghton Copper	.75
Internountain	.85
Iron Cap, Com.	14
Iron Cap Cop., pf.	‡14½
Mexican Metals	.26
Mines of America	1⅛
Mojave Tungsten	.29
Nat. Zinc & Lead	.28
Nevada-Douglas	1⅛
New Baltic	.75
New Cornelia	14⅛
Oneco	.25
Pacific Mines	‡.35
Rex Cons.	.13

SALT LAKE*	Nov. 26
Bannack	.26
Big Four	‡.01
Cardiff	2.00
Colorado Mining	.10
Daly	1.40
Daly-Judge	7.00
Empire Copper	1.17
Gold Chain	.14
Grand Central	.50
Iron Blossom	.55
Lower Mammoth	.03
May Day	.03
Moscow	.11
Prince Con.	.78
Rico Wellington	.18
Silver-King Coal'n	2.60
Silver King Con.	3.37½
Sioux Con.	.03
So. Hecla	1.00
Tintic Standard	1.45
Uncle Sam	.02
Wilbert	.14
Yankee	.02

TORONTO*	Nov. 26
Adanac	.14
Bailey	.05
Beaver Con.	.27
Chambers Ferland	.10
Coniagas	2.95
Hargraves	.08
La Rose	.35
Peterson Lake	.08
Temiskaming	.26
Wettlaufer-Lor.	.05
Davidson	.32
Dome Exten.	.09
Dome Lake	.14
Hollinger	4.95
McIntyre	1.31
Newray	.41
Porcu. Crown	.20
Teck-Hughes	.33
Vipond	.18
West Dome	.13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Nov. 27
Cresson Con.	5.00
Doctor Jack Pot.	.03½
Elkton Con.	.03½
El Paso	.15
Gold Sovereign	.02½
Golden Cycle	1.69½
Granite	.39½
Isabella	.08½
Mary McKinney	.06½
Portland	1.10
United Gold M.	.15½
Vindicator	.32

LONDON	Nov. 8		
Alaska Tre'dwell	‡£1	0s	0d
Burma Corp.	4	1	3
Cam & Motor	0	11	0
Camp Bird	0	8	0
El Oro	0	10	0
Esperanza	0	8	3
Mexican Mines	5	17	6
Min. Corp. Can.	0	16	6
Nechi, pfd.	0	10	0
Oroville	0	18	9
Santa Gert'dis.	0	14	6
Tomboy	1	1	0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604	.....	25.094	34.192	.....
Dec.	54.971	75.765	.....	26.373	36.410	.....
Year	49.684	65.661	.....	23.675	31.315	.....

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	.....	134.659	.....	155.432	.....
Dec.	31.890	.....	145.316	.....	162.842	.....
Year	27.202	.....	116.059	.....	138.281	.....

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	.....	186.932	.....
December	42.635	.....	183.368	.....
Av. year	43.480	.....	182.096	.....

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.597	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	.....	6.945	.....	30.500	.....
December	7.513	.....	7.405	.....	30.500	.....
Year	6.853	.....	6.777	.....	31.359	.....

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	7.983	9.659	7.813	54.159	54.000
Nov.	11.592	.....	11.422	.....	56.023	.....
Dec.	10.665	.....	10.495	.....	55.842	.....
Year	12.804	.....	12.634	.....	72.071	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07	.....	28.18	.....	26.55	.....
December	35.16	.....	30.95	.....	30.79	.....
Year	$23.88	.....	$20.98	.....	$21.15	.....

‡ As reported by W. P. Snyder & Co.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons if so requested.

COPPER

8312—ANALYSIS—The Determination of Oxidized Copper in Ores. H. D. Hunt and R. V. Thurston. (Colo. School of Mines Mag., Sept., 1917; 1¾ pp.) 40c.

8313—ANALYSIS—The Spectroscopic Determination of Small Amounts of Lead in Copper. C. W. Hill and G. P. Luckey. (Advance copy, Am. Electrochem. Soc., Oct., 1917; 6 pp., illus.)

8314—ELECTROLYTIC RECOVERY of Copper and Sulphuric Acid from Copper-Mill Pickling Solutions. J. L. Jones. (Advance copy, Am. Electrochem. Soc., Oct., 1917; 7 pp., illus.)

8315—FLOTATION—The Importance of the Flotation Process in the Metallurgy of Copper. E. P. Mathewson. (Journ. Ind. and Eng. Chem., Nov., 1917; ½ p.)

8316—GEOLOGY—Physiographic Conditions and Copper Enrichment; Discussion. (Econ. Geol., Sept., 1917; 7 pp., illus.)

8317—GEOLOGY—Preliminary Note on the Occurrence of Chalmersite, $CuFe_2S_3$, in the Ore Deposits of Prince William Sound, Alaska. Bertrand L. Johnson. (Econ. Geol., Sept., 1917; 6¼ pp.)

8318—HYDRO-ELECTRIC PLANT—A Small Hydro-Electric Development on Top of the Andes. J. H. Stokes. (Gen. Elec. Rev., Oct., 1917; 3 pp., illus.)

8319—JAPANESE COPPER PRODUCTION. Kenzo Ikeda. (Min. and Sci. Press, Oct. 27, 1917; 1 p.)

8320—LEACHING—Recent Developments in Connection with the Use of Sulphur Dioxide in Hydrometallurgy. Edward R. Weidlein. (Journ. Ind. and Eng. Chem., Nov., 1917; ¾ p.)

8321—MIAMI, ARIZONA: The Milling of the Ore.—IV. T. A. Rickard. (Min. and Sci. Press, Oct. 20, 1917; 9⅝ pp., illus.)

8322—RUSSIA—Mining and Smelting Copper Ore at Kalata. F. W. Draper. (Min. and Sci. Press, Sept. 1, 1917; 5¾ pp., illus.)

8323—SECONDARY METALS IN 1916. J. P. Dunlop. (Mineral Resources of U. S., 1916—Part I, Oct. 6, 1917; 14 pp.)

8324—SMELTERY SMOKE—The Wet Thiogen Process for Recovering Sulphur from Sulphur Dioxide in Smelter Gases. A. E. Wells. (Bull. 133, U. S. Bureau of Mines, 1917; 66 pp., illus.)

GOLD DREDGING AND PLACER MINING

8325—AUSTRALIA—Hydraulic Sluicing for Gold and Tin. Arthur H. P. Moline. (Min. and Eng. Rev., Sept. 5, 1917; 9 pp., illus.)

8326—HYDRAULIC SLUICING for Gold and Tin—I-II. Arthur H. P. Moline. (Chem. Eng. and Min. Rev., Sept. 5, Oct. 5, 1917; 16 pp., illus.)

GOLD AND SILVER—CYANIDING

8327—AFRICA—Precipitation and Smelting at the Great Fingall Consolidated, Ltd., Day Dawn, W. A. (Journ. West. Austral. Chamber of Mines, July 31, 1917; 2¾ pp.)

8328—UNITED EASTERN Mining and Milling Plant. Otto Wartenweiler. (Bull. 131, A. I. M. E., Nov., 1917; 20 pp., illus.)

GOLD AND SILVER—GENERAL

8329—AGITATION, the Cascade Method of. H. Hardy Smith. (Chem. Eng. and Min. Rev., Oct. 5, 1917; 1¾ pp., illus.)

8330—CANADA—The Mining Industry in That Part of Northern Ontario Served by the Temiskaming & Northern Ontario Railway, 1916. Arthur A. Cole. (Appendix to Annual Report, Temiskaming and Northern Railway Commission, 1917; 36 pp., illus.)

8331—SHAFT COLLAPSE—Further Notes on the Collapse and Recovery of the Central Shaft at the Bantjes Consolidated Mines. G. Hildick-Smith. (Journ. So. Afr. Inst. of Engrs., Sept., 1917; 2 pp.) Supplement to article by Percy Cazalet and W. W. Lawrie in Sept., 1917, issue.

8332—UTAH—The Great Horn Silver Vein, in Beaver County. D. P. Rohlfing. (Salt Lake Min. Rev., Sept. 30, 1917; 1¼ pp., illus.) 20c.

IRON-ORE DEPOSITS, MINING, ETC.

8333—FRANCE Fights for Lost Steel Power. Frances Miltoun. (Iron Tr. Rev., Oct. 18, 1917; 3 pp., illus.)

8334—MANGANIFEROUS IRON ORES of the Cuyuna District, Minnesota. E. C. Harder. (Bull. 129, A. I. M. E., Sept., 1917; 31¼ pp., illus.)

8335—SUPPLY of Iron Ore. (Iron and Coal Tr. Rev., Oct. 12-19, 1917; 2 pp., illus.) Abstract of two lectures before Royal Society of Arts by Professor W. G. Fearnsides, M. A.

IRON AND STEEL—METALLURGY

8336—ACID OPEN-HEARTH PROCESS. F. Rogers. (Advance copy, Iron and Steel Inst., Sept., 1917; 12 pp., illus.)

8337—ACID OPEN-HEARTH STEEL. Investigation Upon a Cast of. T. D. Morgans and F. Rogers. (Advance copy, Iron and Steel Inst., Sept., 1917; 10 pp., illus.)

8338—ALLOY STEELS—Alloy Metals, Production and Uses, Especially in Relation to the War: Notes on Observation Made Abroad. Geo. K. Burgess. (Journ. Ind. and Eng. Chem., Nov., 1917; 1 p.)

8339—BLAST FURNACE—Pre-Heating Cleaned Gas for Stoves. John Ruddiman. (Iron Tr. Rev., Oct. 25, 1917; 2½ pp., illus.)

8340—BRIQUETTING IRON ORE—Notes on the Present Knowledge and Practice in Regard to the Briquetting of Iron Ores. Guy Barrett and T. B. Rogerson. (Advanced copy, Iron and Steel Inst., Sept., 1917; 42 pp., illus.)

8342—CONSTRUCTIONAL STEELS and Their Heat Treatment. Fred. C. A. H. Lantsberry. (Journ. Soc. Chem. Ind., Sept. 29, 1917; 1¼ pp.)

8344—FRANCE Fights for Lost Steel Power. Frances Miltoun. (Iron Tr. Rev., Oct. 18, 1917; 3 pp., illus.)

8345—PROCESSES—Les Aciers Bessemer, Martin, Electriques, et au Creuset. Georges Charpy. (Génie Civil, Sept. 29, 1917; 3½ pp.) 40c.

LEAD AND ZINC

8347—CONCENTRATION—The Hancock Jig in the Concentration of Lead Ores. Harold Rabling. (Bull. 128, A. I. M. E., Aug., 1917; 12 pp., illus.)

8348—CONVERTER FUME—Recovery of Converter-Fume at Tooele, Utah. L. S. Austin. (Min. and Sci. Press, Oct. 27, 1917; 1¾ pp., illus.)

8349—FLOTATION of Lead and Zinc in the Joplin District. C. A. Wright. (Min. and Sci. Press, Oct. 20, 1917; 3½ pp.) 20c.

8350—GAS FILTRATION—An Automatic Filter at Depue. G. S. Brooks and L. G. Duncan. (Bull. 131, A. I. M. E., Nov., 1917; 6¼ pp., illus.)

8351—INDO-CHINA Une Usine a Zinc au Tonkin. (Metaux et Alliages, Aug., 1917; 4 pp.)

8352—JOPLIN DISTRICT, Ore-Dressing in the. Clarence A. Wright. (Bull. 130, A. I. M. E., Oct., 1917; 27 pp.)

8353—METALLURGY—L'Etat Actuel de l'Industrie du Plomb. Ch. Dantin. (Génie Civil, Aug. 25, 1917; 6 pp., illus.) 40c.

8354—METALLURGY—Salt in the Metallurgy of Lead. Oliver C. Ralston, Clyde E. Williams, Marvin J. Udy and G. J. Holt. (Bull. 128, A. I. M. E., Aug., 1917; 11¼ pp.)

8355—MUNTZ METAL—Typical Cases of the Deterioration of Muntz Metal (60:40 Brass) by Selective Corrosion. Henry S. Rawdon. (Reprint from Journ. Am. Inst. of Metals, Vol. XI, No. 2, 1917; 40 pp., illus.)

8356—OKLAHOMA—The Miami, Oklahoma, Zinc and Lead District. E. E. McIntyre. (Min. and Oil Bull., Sept., 1917; 2¼ pp.) 20c.

8357—OZARK REGION—Geology and Mineral Deposits of the Ozark Region. H. A. Buehler. (Bull. 130, A. I. M. E., Oct., 1917; 20 pp., illus.)

8358—SECONDARY METALS in 1916. J. P. Dunlop. (Mineral Resources of U. S., 1916—Part I, Oct. 6, 1917; 14 pp.)

8359—SPHALERITE—The Relation of Sphalerite to Other Sulphides in Ores. L. P. Teas. (Bull. 131, A. I. M. E., Nov., 1917; 15 pp., illus.)

8360—ZINC-ORE DEPOSITS, Principles Governing. Frank L. Nason. (Min. and Sci. Press, Nov. 3, 1917; 4¼ pp., illus.)

8361—ZINC OXIDE—Oxide of Zinc. Geo. C. Stone. (Bull. 129, A. I. M. E., Sept., 1917; 12 pp., illus.) 40c.

8362—ZINC REFINING. Leland E. Wemple. (Bull. 131, A. I. M. E., Nov., 1917; 14¼ pp., illus.)

OTHER METALS

8363—ALUMINUM—New Method for the Recovery of Salts of Potassium and Aluminum from Mineral Silicates. J. C. W. Frazer, W. W. Holland and E. Miller. (Journ. Ind. and Eng. Chem., Oct., 1917; 1¼ pp.)

8364—ALUMINUM—The Analysis of Some Aluminum Alloys. J. H. Stansbie. (Journ. Soc. Chem. Ind., July 31, 1917; 1¾ pp.)

8365—ANTIMONY, Its Metallurgy and Uses. K. C. Li. (Journ. Am. Inst. of Metals, June, 1917; 21 pp., illus.)

8366—CHROME DEPOSITS of Alaska. W. P. Lass. (Min. and Sci. Press, Nov. 3, 1917; ¾ p., illus.)

8367—MANGANESE—Alloy Metals, Production and Uses, Especially in Relation to the War: Notes on Observation Made Abroad. Geo. K. Burgess. (Journ. Ind. and Eng. Chem., Nov., 1917; 1 p.)

8368—MANGANESE Deposits of the Caddo Gap and De Queen Quadrangles, Arkansas. Hugh D. Miser. (Bull. 660-C, U. S. Geol. Surv., Sept. 12, 1917; 64 pp., illus.)

8369—MANGANESE—The Determination of Available Oxygen in Pyrolusite. O. L. Barnebey. (Journ. Ind. and Eng. Chem., Oct., 1917; 5¾ pp., illus.)

8370—MANGANESE AND SILICON—Constructional Steels and Their Treatment. Fred. C. A. H. Lantsberry. (Journ. Soc. Chem. Ind., Sept. 29, 1917; 1¼ pp.)

8371—SECONDARY METALS IN 1916. J. P. Dunlop. (Mineral Resources of U. S., 1916—Part I, Oct. 6, 1917; 14 pp.)

8372—THORIUM Minerals in 1916. Waldemar T. Schaller. (Mineral Resources of U. S., 1916—Part II, Sept. 13, 1917; 15 pp.)

8373—TIN—Concentration of Tin Gravels and a Proposed Alternative for Sluice-Boxes and Trommels. W. W. Richardson. (Min. Mag., Oct., 1917; 4 pp., illus.)

8374—TIN—Hydraulic Sluicing for Gold and Tin—I-II. Arthur H. P. Moline. (Min. and Eng. Rev., Sept. 5-Oct. 5, 1917; 16 pp., illus.)

8375—TIN—Le Traitement Electrolytique des fers Blancs. D. Guide and Albert Hutin. (Rev. Chim. Ind., July, 1917; 2½ pp., illus.) 40c.

8377—TUNGSTEN—King Island Scheelite Company. (Chem. Eng. and Min. Rev., Oct. 5, 1917; 1¼ pp., illus.)

8378—TUNGSTEN—Tungsten in the Bishop District, Inyo County, California. H. W. Moore. (Min. and Oil Bull., Oct., 1917; 1¼ pp., illus.)

NONMETALLIC MINERALS

8379—ASPHALT. Related Bitumens and Bituminous Rock in 1916. John D. Northrop. (Mineral Resources of U. S., 1916—Part II, Sept. 22, 1917; 19 pp.) Continuation of article previously indexed.

8381—GRAPHITE. B. Dunstan. (Queensland Govt. Min. Journ., Sept. 15, 1917; 6¾ pp.) 14th in series of Queensland mineral deposits.

8382—GRAPHITE. Henry G. Ferguson. (Bull. 666-L, U. S. Geol. Surv., 1917; 7 pp.)

8383—OZOKERITE from the Thrall Oil Field. E. P. Schoch. (Bull. 66, Univ. of Tex., Nov. 25, 1916; 3 pp.)

8384—PHOSPHATES at Gore. Lionel C. Ball. (Queensland Govt. Min. Journ., Sept. 15, 1917; 1⅝ pp., illus.)

8385—POTASH—The Mineral Industries of the United States; Fertilizers: An Interpretation of the Situation in the United States. Joseph E. Pogue. (Bull. 102, Part 2, U. S. National Museum, Smithsonian Inst., Oct. 10, 1917; 22 pp., illus.)

8387 — POTASH — The Recovery of Water-Soluble Potash as a By-Product in the Cement Industry. Wm. H. Ross and Albert R. Merz. (Journ. Ind. and Eng. Chem., Nov., 1917; 3¼ pp.)

8388—SALT—Las Salinas de Mexico y la Industria de la Sal Comun. Jose C. Zarate. (No. 2, Anales Inst. Geol. de Mexico, 1917; 71 pp., illus.)

PETROLEUM AND NATURAL GAS

8389—GASOLINE, The Supply of. Milton A. Allen. (Min. and Sci. Press, Oct. 6, 1917; 1⅞ pp.)

8390—GASOLINE FROM NATURAL GAS—Extraction of Gasoline from Natural Gas by Absorption Methods. Geo. A. Burrell, P. M. Biddison and G. G. Oberfell. (Bull. 120, U. S. Bureau of Mines, 71 pp., illus.)

8391—GEOLOGY—A Few Notes on the Future Work of the Petroleum Geologist in the Mid-Continent Oil Fields. Dorsey Hager. (Bull. 130, A. I. M. E., Oct., 1917; 3 pp.)

8392—GEOLOGY—Oil and Its Geology. Milton A. Allen. (Bull. 65, Univ. of Ariz. Bureau of Mines, 1917-18; 32 pp., illus.)

8393—OIL-SHALE in the United States. Dean E. Winchester. (Econ. Geol., Sept., 1917; 15 pp., illus.)

8394—OKLAHOMA—Age of the Oil in Southern Oklahoma Fields. Sidney Powers. (Bull. 131, A. I. M. E., Nov., 1917; 12 pp., illus.)

8395—SULPHUR—The Relation of Sulphur to Variation in the Gravity of California Petroleum. (Bull. 130, A. I. M. E., Oct., 1917; 4 pp.) Discussion of paper by G. Sherburne Rogers.

8396—TENNESSEE—Structure of the Waynesboro Quadrangle with Special Reference to Oil and Gas. Hugh D. Miser. (Tenn. Geol. Surv., Oct., 1917; 20¼ pp., illus.)

8397—TEXAS—The Chemical Composition of the Petroleums Obtained at Thrall, Texas. E. P. Schoch and W. T. Read. (Bull. 66, Univ. of Tex., Nov. 25, 1916; 5½ pp.)

8398—TEXAS — The Thrall Oil Field. J. A. Udden and H. P. Bybee. (Bull. 66, Univ. of Tex., Nov. 25, 1916; 78 pp., illus.)

ECONOMIC GEOLOGY—GENERAL

8399—COPPER-ORE ENRICHMENT — Physiographic Conditions and Copper Enrichment, Discussion. (Econ. Geol., Sept., 1917; 7 pp., illus.)

8400—LATERITE: Its Origin, Structure and Minerals. J. Morrow Campbell. (Min. Mag., Oct., 1917; 8½ pp., illus.)

8401 — LATERITIC ORE DEPOSITS, with Comments on the Nature of Laterites in General. Willet G. Miller. (Reprint from Vol. XXVI, Part I, Ont. Bureau of Mines, 1917; 19 pp., illus.)

8402—MEXICAN OIL FIELDS—Funnel and Anticlinal-Ring Structure Associated with Igneous Intrusions in the Mexican Oil Fields. V. R. Garfias and H. J. Hawley. (Bull. 128, A. I. M. E., Aug., 1917; 13 pp., illus.)

8403—MONTANA—Ore Deposits of the Boulder Batholith of Montana. (Bull. 130, A. I. M. E., Oct., 1917; 1¼ pp.) Discussion of paper of Paul Billingsley and J. A. Grimes.

8404—OKLAHOMA—Age of the Oil in Southern Oklahoma Fields. Sidney Powers. (Bull. 131, A. I. M. E., Nov., 1917; 12 pp., illus.)

8405—PETROLEUM—Oil and Its Geology. Milton A. Allen. (Bull. 65, Univ. of Ariz. Bureau of Mines, 1917-18; 32 pp., illus.)

8406—PETROLEUM IN TENNESSEE—Structure of the Waynesboro Quadrangle with Special Reference to Oil and Gas. Hugh D. Miser. (Tenn. Geol. Surv., Oct., 1917; 20¼ pp., illus.)

8407—UNDERGROUND VOLATILE AGENTS. Genetic Classification of. Reginald A. Daly. (Econ. Geol., Sept., 1917; 18 pp.)

8408—ZINC-ORE DEPOSITS, Principles Governing. Frank L. Nason. (Min. and Sci. Press, Nov. 3, 1917; 4¼ pp., illus.)

MINING—GENERAL

8409—BRITISH COLUMBIA—The Granby Mine at Anyox, B. C. Wakely A. Williams. (Eng. and Min. Journ., Oct. 13, 1917; 6 pp., illus.)

8410—CANADA—The Mining Industry in That Part of Northern Ontario Served by the Temiskaming & Northern Ontario Railway, 1916. Arthur A. Cole. (Appendix to Annual Report, Temiskaming and Northern Railway Commission, 1917; 36 pp., illus.)

8412 — DRILLING — Comparative Tests of Hammer Drill Bits. Carroll R. Forbes and Joseph C. Barton. (Bull. 128, A. I. M. E., Aug., 1917; 22 pp., illus.)

8413—ELECTRIC WINDING for Mines. W. R. Evans. (Min. Mag., 1917; 7 pp., illus.)

8414—EXPLOSIVES—Production of Explosives in the United States During the Year 1916. Albert H. Fay. (U. S. Bureau of Mines, 1917; 24 pp.)

8415 — HOISTING — Recent Developments of the Whiting Hoist as Applied to Deep Winding. B. Gray and J. Whitehouse. (Journ. So. Afr. Inst. of Engrs., Sept., 1917; 1¼ pp.)

8416—HOSPITALS—Design of Small Mine Hospitals. O. L. Puckett and J. B. De Hart. (Coal Age, Oct. 13, 1917; 4¼ pp., illus.) 20c.

8417—HOUSES for Mine Villages. A. F. Huebner. (Coal Age, Oct. 27, 1917; 3¼ pp., illus.)

8418—INCLINE TOP-SLICING Method. W. G. Scott. (Bull. 131, A. I. M. E., Nov., 1917; 11 pp., illus.)

8419—MINE MODELS. (Bull. 130, A. I. M. E., Oct., 1917; 1⅛ pp.) Discussion of paper of H. H. Stoek.

8420—SAMPLING MINERALIZED VEINS. Geo. R. Fansett. (Bull. 66, Univ. of Ariz. Bureau of Mines, 1917-18; 5 pp., illus.)

8421—SANITATION—Control of Hookworm Infection at the Deep Gold Mines of the Mother Lode, California. James G. Cumming and Joseph H. White. (Bull. 139, U. S. Bureau of Mines, 1917; 52 pp., illus.)

8422—SHAFT COLLAPSE—Further Notes on the Collapse and Recovery of the Central Shaft at the Bantjes Consolidated Mines. G. Hildick-Smith. (Journ. So. Afr. Inst. of Engrs., Sept., 1917; 2 pp.) Supplement to article written by Percy Cazalet and W. W. Lawrie in Sept., 1917, issue.

8423 — SKIPS — Skip-Changing Devices at the Butte Mines. Theodore Pilger. (Min. and Sci. Press, Oct. 27, 1917; 3¼ pp., illus.)

8424—UNITED EASTERN Mining and Milling Plant. Otto Wartenweiler. (Bull. 131, A. I. M. E., Nov., 1917; 20 pp., illus.)

FLOTATION

8425—AGITATION, the Cascade Method of. H. Hardy Smith. (Chem. Eng. and Min. Rev., Oct. 5, 1917; 1⅞ pp., illus.)

8426—BIBLIOGRAPHY of Recent Literature on Flotation of Ores, July to December, 1916. Compiled by D. A. Lyon, O. C. Ralston, F. B. Laney and R. S. Lewis. (U. S. Bureau of Mines, 1917; 27 pp.)

8427—CANADIAN WOOD OILS for Ore Flotation. R. E. Gilmore and C. S. Parsons. (Bull. 67, Can. Min. Inst., Nov., 1917; 23 pp.)

8428—COPPER—The Importance of the Flotation Process in the Metallurgy of Copper. E. P. Mathewson. (Journ. Ind. and Eng. Chem., Nov., 1917; ¼ p.)

8429—LEAD AND ZINC—Flotation of Lead and Zinc in the Joplin District. C. A. Wright. (Min. and Sci. Press, Oct. 20, 1917; 3½ pp.) 20c.

8430—PREFERENTIAL FLOTATION. W. Shellshear. (Min. and Sci. Press, Oct. 27, 1917; 4½ pp.)

METALLURGICAL—GENERAL

8431—ALLOYS—The Electrical Properties of Some High Resistance Alloys. M. A. Hunter and F. M. Sebast. (Reprint from Journ., Am. Inst. of Metals, Vol. XI, No. 2, 1917; 24 pp., illus.)

8432 — BEARING METALS — Casting Bearings in Sand and Metal Moulds. R. R. Clarke. (Reprint from Journ., Am. Inst. Metals, Vol. XI, No. 2, 1917; 14 pp.)

8433—BLENDE ROASTING FURNACE, Choice of a. March F. Chase. (Eng. and Min. Journ., Oct. 20, 1917; 6¾ pp., illus.)

8434—BRASS Rolling Mill Alloys. R. A. Wood. (Reprint from Journ. Am. Inst. of Metals, Vol. XI, No. 2, 1917; 11 pp.)

8435—CONVERTER FUME — Recovery of Converter-Fume at Tooele, Utah. L. S. Austin. (Min. and Sci. Press, Oct. 27, 1917; 1⅞ pp., illus.)

8436 — ELECTRIC-FURNACE ELECTRODES — Les Électrodes pour Fours Électriques. Jean Escard. (Génie Civil, Aug. 4, 1917; 5 pp., illus.) 40c.

8438 — GAS FILTRATION — An Automatic Filter at Dupue. G. S. Brooks and L. G. Duncan. (Bull. 131, A. I. M. E., Nov., 1917; 6½ pp., illus.)

8439 — NOXIOUS GASES — Fifty-Third Annual Report on Alkali, etc., Works, by the Chief Inspector, 1916. (Journ. Soc. Chem. Ind., Sept. 29, 1917; 2¼ pp.)

8440 — PHYSICAL CHEMISTRY—Physico-Chemical Data Needed by Metallurgists. J. W. Richards. (Journ. Ind. and Eng. Chem., Nov., 1917; 1⅛ pp.)

8441—REFRACTORIES—Palmerton Zinc Refractories. C. P. Fiske. (Bull. 130, A. I. M. E., Oct., 1917; 20 pp., illus.)

8442—REFRACTORIES; Testing Refractory Materials. J. W. Mellor. (Iron and Coal Tr. Rev., Oct. 5, 1917; ½ p.)

8443 — SMELTERY SMOKE — The Wet Thiogen Process for Recovering Sulphur from Sulphur Dioxide in the Smeltery Gases. A. E. Wells. (Bull. 133, U. S. Bureau of Mines, 1917; 66 pp., illus.)

8444—ZINC OXIDE FURNACES. John F. Cregan. (Eng. and Min. Journ., Oct. 20, 1917; 5⅞ pp., illus.)

SAMPLING AND ASSAYING

8445—ALLOYS—The Analyses of Brass or Bronze and Babbitt. E. W. Hagmaier. (Reprint from Journ., Am. Inst. of Met., Vol. XI, No. 2, 1917; 10 pp.)

8446 — BONE-ASH CUPELS. Frederic P. Dewey. (Bull. 131, A. I. M. E., Nov., 1917; 29 pp.)

8447 — MANGANESE — The Determination of Available Oxygen in Pyrolusite. O. L. Barnebey. (Journ. Ind. and Eng. Chem., Oct., 1917; 5⅞ pp., illus.)

8448—SAMPLING MINERALIZED VEINS. Geo. R. Fansett. (Bull. 66, Univ. of Ariz. Bureau of Mines, 1917-18; 5 pp., illus.)

8449—SULPHUR DIOXIDE, The Determination of. O. R. Sweeney, Harry E. Outcault and James R. Withrow. (Journ. Ind. and Eng. Chem., Oct., 1917; 1⅞ pp.)

8450—TIN—New Methods for the Estimation of Tin in Low-Grade Ores, Trailings and Slime. Alfred Adair. (So. Afr. Min. Journ., Aug. 25, 1917; 1 p.)

INDUSTRIAL CHEMISTRY

8455—CANADA—Problems Relating to the Mineral Industry of Canada. W. J. Dick. (Reprinted Report of Commission of Conservation, Can., 1917; 19 pp.)

8457—NITROGEN—The Mineral Industries of the United States; Fertilizers: An Interpretation of the Situation in the United States. Joseph E. Pogue. (Bull. 102, Part 2, U. S. National Museum, Smithsonian Inst., Oct. 10, 1917; 22 pp., illus.)

8458 — NOXIOUS GASES — Fifty-Third Annual Report on Alkali, Etc., Works, by the Chief Inspector, 1916. (Journ. Soc. Chem. Ind., Sept. 29, 1917; 2¼ pp.)

8459—POTASH—The Recovery of Water-Soluble Potash as a By-Product in the Cement Industry. Wm. H. Ross and Albert R. Merz. (Journ. Ind. and Eng. Chem., Nov., 1917; 3¼ pp.)

FUELS

8460—PEAT DEPOSITS of Minnesota. E. K. Soper. (Econ. Geol., Sept., 1917; 23 pp., illus.)

8461—CRUDE OIL—New Way to Burn Crude Oil; Gasifying the Oil in a Specially Designed Vaporizer. W. A. Janssen. (Iron Age, Nov. 1, 1917; 1 p., illus.)

8462—COKING of Illinois Coals. F. K. Ovitz. (Bull. 138, U. S. Bureau of Mines 1917; 71 pp., illus.)

8463—COAL—Effects of Storage Upon the Properties of Coal. S. W. Parr. (Bull. 97, Univ. of Ill., May 28, 1917; 39 pp., illus.)

8464—COAL—Deterioration in the Heating Value of Coal During Storage. Horace C. Porter and F. K. Ovitz. (Bull. 136, U. S. Bureau of Mines, 38 pp., illus.)

MISCELLANEOUS

8468—BOILER PLATES—The Failure of Boiler Plates in Service, and Investigations of the Stresses That Occur in Riveted Joints. E. B. Wolff. (Advance copy, Iron and Steel Inst., Sept., 1917; 22 pp., illus.)

8470 — CONCRETE HOUSES—Building 100 Concrete Houses With Standardized Designs and Forms. (Eng. and Contract, Oct. 24, 1917; 1¼ pp., illus.)

8471—EXPLOSIVES—Production of Explosives in the United States During the Year 1916. Albert H. Fay. (U. S. Bureau of Mines, 1917; 24 pp.)

8475—ROOFING—Analysis and Testing of Prepared Roofings. Herbert Abraham. (Journ. Ind. and Eng. Chem., Nov., 1917; 4⅝ pp., illus.)